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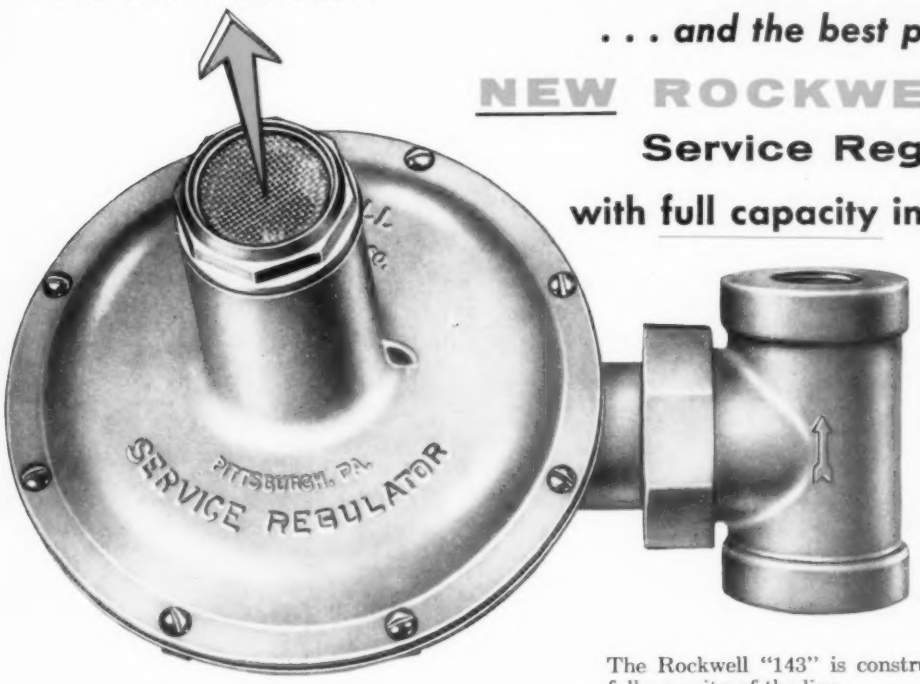

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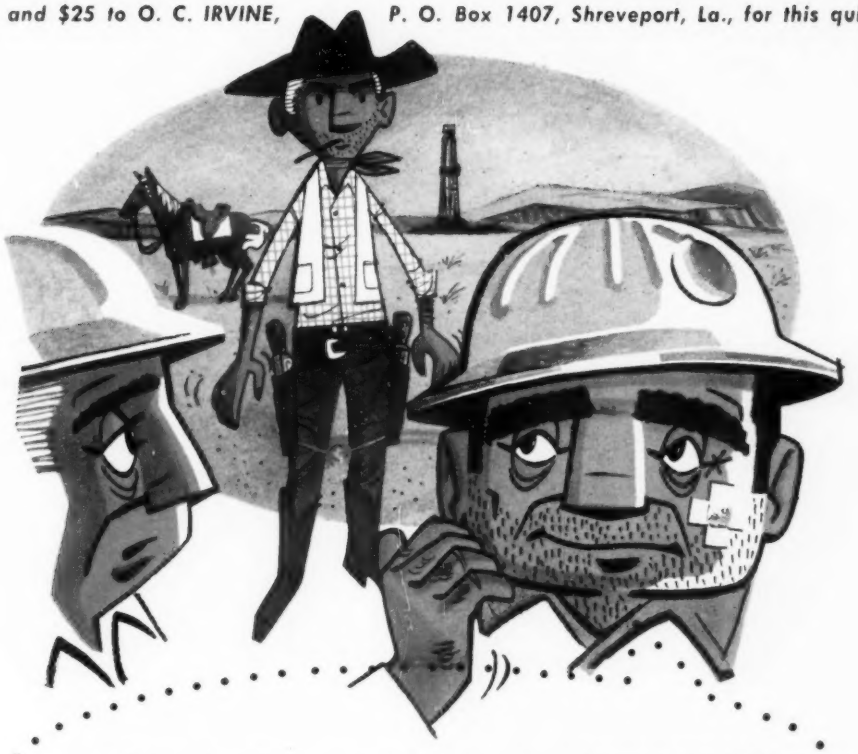

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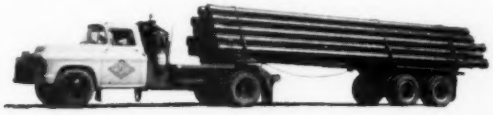

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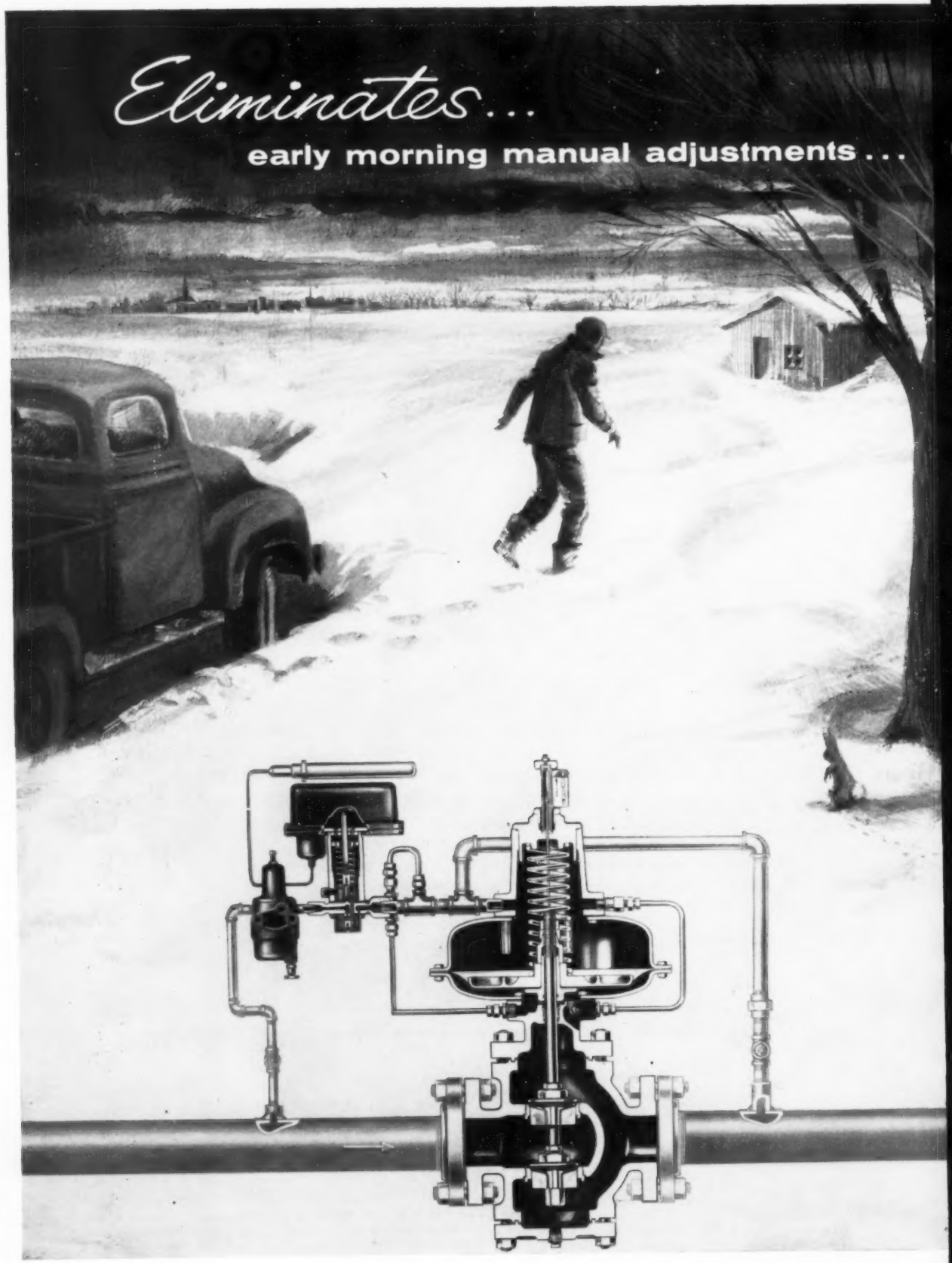
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GAS Thermally Thinking

AN industry with a commodity essential to living standards of ordinary consumers is usually classed as a public utility. Then, public utility regulation is substituted for free market competition.

We now have public utility regulation of the distribution operations of our gas industry. And the long-distance pipelines are a different "style" of public utility. They are under a rather different type of regulation. Gas producers have even come under some kind of federal regulation.

Public utility regulation—even in the less classical forms—always produces distortions and misallocations. It inherently works imperfectly. The only logical measure of its performance is in public opinion relative to an industry.

Public policy toward the natural gas industry is in a state of suspense. Three factors have been the result of this public state of mind toward our industry.

First and most important is the move to write new natural gas laws—now, the Harris-O'Hara bill. Our industry's differences have been pretty well settled. Public policy will make itself known.

Second, moves are being made to increase gas company returns to offset the increased cost of newly borrowed funds. Tennessee Gas Transmission led the unheralded, but courageous and strong-cased, fight in this behalf.

Gas company diversification is the third factor. There is a very definite trend in this direction. With rate of return regulated at 6 to 6.5 per cent and interest rates on borrowed funds at about 6 per cent and up, gas companies are rapidly entering profitable non-regulated businesses as "sidelines."

The sideline businesses include petro-chemicals, refining and marketing of oil and gasoline, and many other industries—from cement to insurance.

Special emphasis is on exploration and drilling for gas and oil. These operations build valuable reserves and improve income tax matters. They generate future depletion allowances, too.

These factors and trends will continue until the ball of public policy bounces one way or the other. But, this may not be until 1959-60. Watch diversification, the new natural gas law(s), and moves for regulatory-body approvals of higher rates of return.

J. Fred Ebdon

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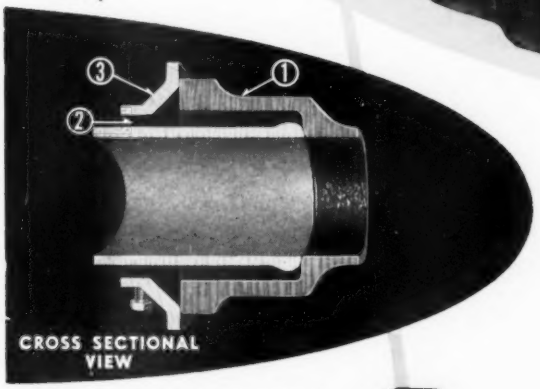

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GAS highlights

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

AUGUST 1957

Third Canadian pipeline is proposed as PG&E (San Francisco) announced plans to build a 36-incher at a cost of $330 million to tap Alberta (Canada) natural gas reserves and move gas to northern — and probably southern — California. Initial deliveries of 400 MMcf/day are planned for 1960. Half of the system's capacity has been offered southern California gas utilities. SoCal and SoCounties, through Pacific Lighting, have expressed intention to participate.

Canadian natural gas may find its largest Canadian market yet in the production of high-grade iron from low-grade ore at the mine site. A new process has been reported to make a "melting stock" that can go directly to secondary producers (pipe rolling mill, for instance) for melting with scrap metal. Could skip the blast furnaces of integrated steel producers. Most low-grade ore reserves and strikes lay in the Sudbury Basin and across northern Ontario to the Manitoba border—many within economic distance of the Trans-Canada pipeline, or the Crown Corp. section thereof. The new process may spur development of tremendous ore tonnages now in place, but not very attractive economically.

Westcoast Transmission recently reported its line will be in operation ahead of schedule. August 1 of this year is the date. Pacific Petroleum—one-million share-holder in Westcoast Transmission—is still lining up acreage in the Savanna Creek gas fields. Sunray-Midcontinent, El Paso Natural and others are also in on this gas play.

Canadian gas appliance manufacturers are struggling under the cost of retooling to produce more modern units. But competition from our side of the border makes redesign imperative. Canadian experts expect the competition to become sharper. Plum that both Canadian and U. S. gas appliance manufacturers are competing for? The 325,000 unit sales estimated for 1958 by D. K. Yorath (Canadian Western Natural Gas and Northwestern Utilities) at CGA's Jasper Park meeting. Here's the breakdown:

Gas ranges	93,000
Gas water heaters	90,000
Gas central heaters (warm air)	60,000
Gas floor furnaces and wall heaters	7,500
Gas space heaters	31,000
Gas domestic boilers	4,000
Gas conversion burners	30,000
Gas hot plates	10,000
Total gas appliance sales for 1958	325,500

Audrey, that taciturn and pernicious hurricane that roared into the Gulf Coast way ahead of the autumnal equinox, was rough on offshore operations, but not nearly so destructive (to gas and petroleum facilities) as initially feared. Actually, considering the extremes in wind velocity and wave action she stirred up, damage to gas and oil installation in the Gulf was relatively light. Tennessee Gas Transmission, Continental Oil, Pure Oil and other "big soulless oil and gas corporations," let their own operations ride while they poured men, equipment, swamp buggies, boats, helicopters and planes into the area to save lives and bring relief to the devastated communities and people. Now, wharf-rats, shanty-boaters, beach combers and old-time Gulf Coast residents are feeling their joints and bunions. Their predictions—a real hurricane season for the Gulf this year, probably the return leg of a cycle.

Tip for gas company managements. In evaluation of job-satisfaction morale, check your accounting group closely. Recent surveys from several gas utilities show accounting-billing personnel morale may lag that of other departments.

Newest company to start down the diversification trail—Arkansas Louisiana Gas Co. A wholly-owned subsidiary company will build a $15 million cement plant at Foreman, Ark.

House Committee on Interstate and Foreign Commerce heard and rejected these major amendments to the Harris-O'Hara bill:

(1) FPC continuing jurisdiction over existing contracts with definite pricing clauses.
(2) FPC using cost to determine reasonable market price.
(3) FPC using cost in pricing company-produced gas.
(4) Substituting "just and reasonable" for "reasonable market price formula" in fixing prices.
(5) FPC jurisdiction over direct sales and prohibition of such sales at below cost prices.
(6) Putting the burden of proof on producers rather than on pipeline companies.
(7) Making pipeline companies render gas service to new communities if gas supply was available and connection was economical.
(8) Prevention of intervention by one pipeline company if said company has not sought to serve communities in its service area when another company proposes to serve the communities.

A clean bill cleared the House Commerce Committee 15 to 13 on July 9. The Rules Committee takes the next shot at it before reaching the floor.

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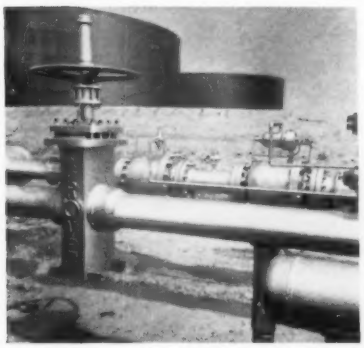

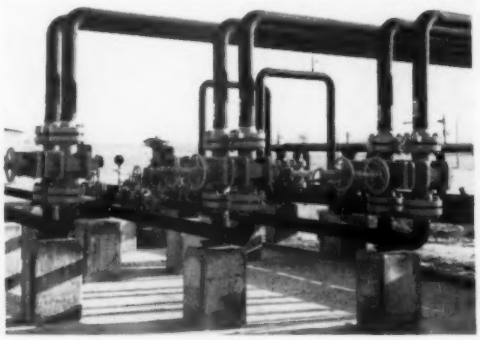

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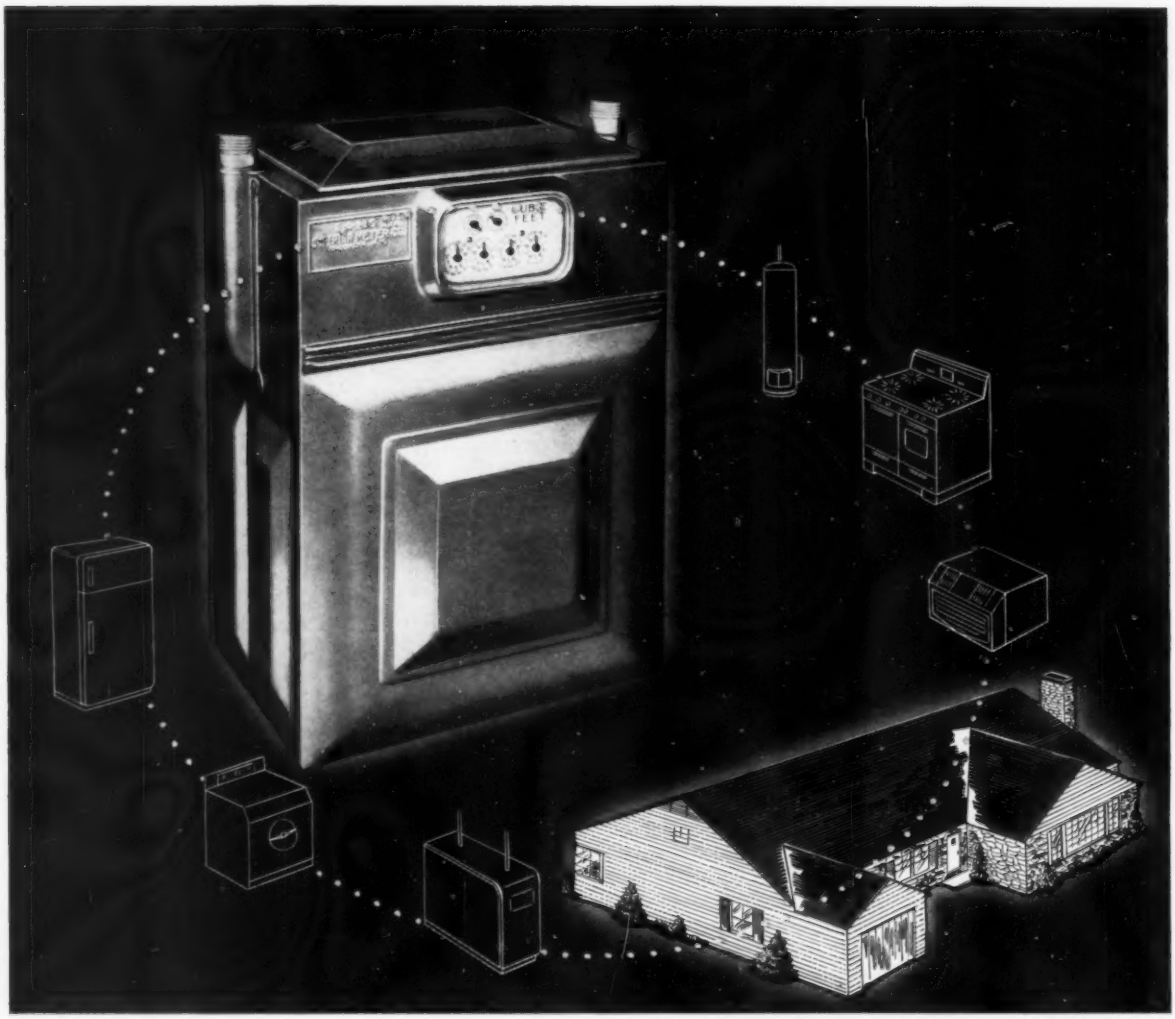

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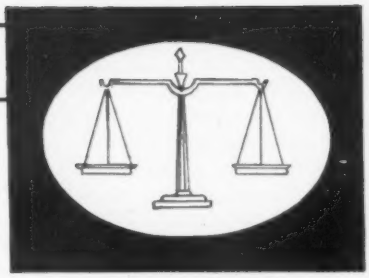

What price incentives to discover more gas?

THREE out of four Americans depend on modern gas service in their homes. Investors have put more than $17 billion in the gas industry to make it the sixth largest in the United States. Natural gas and its liquids supply 26 per cent of the nation's energy needs. With that public interest of the first magnitude in natural gas, it becomes important to find what incentives are necessary to encourage discovery of more natural gas.

A recent decision by a presiding examiner for the Federal Power Commission reveals the trend of regulatory attitude. The examiner concluded that an interstate pipeline company should be allowed a 6 per cent rather than 6½ per cent return. He also ruled that only half of the $10.7 million proposed rate increase was justified. Considering incentives to discover more gas, he decided that the pipeline company's own gas reserves and production should be based on original cost rather than the fair field price of natural gas. That rate-base method resulted in evaluating gas production at $3,785,000 lower than the field price method. That amount represented the incentive management asserted was necessary for it to explore for gas.

Incentive to explore for gas

An executive testified that the pipeline company cannot be expected to engage in exploration for gas unless it is compensated for the risks it assumes at least at the average of what its competitors are receiving. He stated that there is no functional relationship between the cost of discovering gas and its value when produced. It was the witness's opinion that the use of the original cost rate-base standard in such cases had destroyed incentive and stifled the efforts of pipeline companies to discover or acquire their own gas reserves. His conclusion was that such a practice can only lead to a continued decrease in pipeline companies' exploratory activities, and the further segregation of production and transmission facilities to the ultimate detriment of the consuming public.

The witness added that venture capital is used for exploratory operations, and the rewards must be equal to the risks. It is axiomatic that investors may place their funds wherever they please, and that by comparisons they select the industries with the best earnings and prospects with a consideration for the risks. By being placed in a position where the pipeline company may be required to produce its own gas at a low price, the pipelines will have their ability reduced to compete for capital on favorable terms in the production phase of their business. To discover gas a pipeline company must be permitted to compete for capital, and to be successful it should be allowed earnings commensurate with the risks of exploration. The executive concluded by declaring that to achieve this objective requires the valuation of gas produced at the weighted average wellhead price in the gas field. He was not, however, in favor of the use of the field price to determine the cost of produced gas if that was an amount less than cost.

The trial examiner was not convinced by the company's testimony on the necessary incentive for discovering more gas. He stated that under the cost method of ratemaking, an interstate pipeline company has a high-degree of assurance that it will be reimbursed for all expenses for exploring for gas as long as they are prudent. The company receives a return on the capital invested in productive property, and on investment in non-producing leases held for future use. It also recovers the capital originally invested through annual allowances in expenses for depletion and depreciation. The examiner declared that in the rare event a pipeline company should incur a large expense for drilling dry holes for which no allowance had been made by the commission the company could ask the commission for authorization to spread the amount over a period of time as an extraordinary loss, and recover it through customer rates.

The trial examiner held that the evidence did not persuade him that the rate-base method will make the raising of capital more difficult for extensive gas exploration and development operations. He reasoned that the pipeline companies under the rate-base method have financial stability, assured earning power, and the recovery of the capital invested.

The examiner said that he was unable to conclude from the evidence that the use of the original cost rate-base standards had been responsible for the decline since 1942 in the relationship of gas produced by pipeline companies to gas purchased from independent producers. In addition, there was no showing that the pipeline company would use the difference between the allowance for its gas production under the rate-base method, and the allowance at the field price to explore for gas reserves.

The examiner found the com-

*A monthly commentary on national and state developments by an expert in the field of utility law.

pany's proof insufficient to demonstrate that the field price is the minimum amount needed by the pipeline company as an incentive for gas exploration. The examiner was not impressed by the evidence that the average cost of finding additional gas reserves in the United States during the past five years was 11 cents per Mcf. He said the question presented is how much increase in gas rates is needed by the pipeline company as an incentive for discovering more gas above those incentives which result from the use of the rate-base method. He asserted that under the rate-base method the pipeline company can receive an allowance from the FPC in the cost of service for any prudent program of exploration and development based on its own prospective costs. Nationwide averages of the cost per Mcf of finding gas reserves, said the examiner, are not evidence of what the particular pipeline company's exploration cost will be, and they do not prove that the incentive to drill requires more than would be received under the rate-base method.

Extraction operations

The pipeline company had two gasoline extraction plants in the fields from which it produced natural gas. The company contended that the extraction operations should be segregated from its cost of rendering service, and that the $2.4 million in annual net revenues should not be credited to the cost of the natural gas service. The company stated that the extraction of the natural gasoline and other liquid hydrocarbons is not required for the preparation of the raw gas for interstate transportation and sale, and therefore that such operation is a separate business.

The examiner said that the pipeline company's contention lacked merit. He asserted that the gasoline plants should be included in the rate base, the cost of the extraction should be included in the cost of service, and all revenues from the extraction operations should be credited to the cost of natural gas service. The examiner said that the non-essentiality of the operation of the gasoline plants in preparing gas for interstate transmission is not a governing test.

The interstate pipeline company requested an allowance of 6½ per cent of its rate base for return. The examiner noted that in the recent rate cases for this company the FPC had allowed 6 per cent. He also took official notice of the increasing cost of debt capital in the United States, but concluded that a 6 per cent return is reasonable. The company's capital structure consisted of debt and common stock equity. The allowed return would service the debt and provide earnings at the rate of 8.75 percent on the total common stock equity. The examiner found that the return allowed by him would provide earnings to the equity owner "commensurate with returns on investments in other enterprises having corresponding risks." That is the financial standard prescribed by the Supreme Court of the United States in the celebrated Hope Natural Gas Co. case.

Concerning risks, the examiner referred to the fact that the interstate pipeline company had a sheltered position. It sells mostly to companies that distribute in the thickly populated and highly diversified Chicago metropolitan area. These facts materially reduce basic business risks, he said. The examiner decided that such risks as do exist for the interstate pipeline company have been reflected in the cost of capital, and are adequately compensated for by the rate of return of 6 per cent. He added that the exploratory program involves no degree of risk not allowed for in a 6 per cent rate of return.

Where is the incentive?

The interstate pipeline company is entitled to ask where is the incentive to discover more gas. The examiner used an original cost method to price the company's own natural gas production, while the FPC commissioners have recommended to Congress a standard for pricing natural gas as a commodity which would not require the rate-base method. The FPC told Congress that it should be permitted to weigh the interests of the consumer in low prices with the necessity of providing assurance of future natural gas supplies.

The examiner credited the net revenues from the company's extraction operations to the natural gas business. The FPC, however, has recommended to Congress the elimination of any requirement for considering costs or revenues from liquid hydrocarbons obtained in conjunction with the production of natural gas.

The 6 per cent rate of return allowed by the examiner on the gas exploration base of the pipeline company is low in comparison with the 9 per cent rate of return recommended by the FPC staff in pending rate cases involving independent producers. The FPC has recommended to Congress that the same treatment in the evaluating of natural gas be given to independent producers and to pipeline companies which produce their own gas.

The Harris-O'Hara bill to amend the Natural Gas Act will outlaw any rate base formula for pricing gas in the field. The bill directs the FPC to consider the commodity value of natural gas as it is produced. Among the things that the commission must consider are the adequacy of supply, competition in arriving at the price, reasonableness of the contract provisions as related to prices under a definite pricing clause, the quality of the gas, conditions of delivery, and the current level of field prices under other contracts. Independent gas producers and pipeline companies are treated equally with the produced gas being appraised at the reasonable market price.

The Federal Power Commission told the House Committee on Interstate Commerce that the Harris-O'Hara Bill will accomplish two desirable objectives. Those are the protection of consumers in their right to fair prices, and the encouragement of initiative and incentive to explore and develop new sources of natural gas.

The trial examiner's initial decision, of course, is subject to appeal by the interstate pipeline company to the five FPC commissioners. The interstate pipeline company which received such rigid treatment from the trial examiner in the rate case under review will surely ask the FPC, where are the incentives to discover more gas? ■

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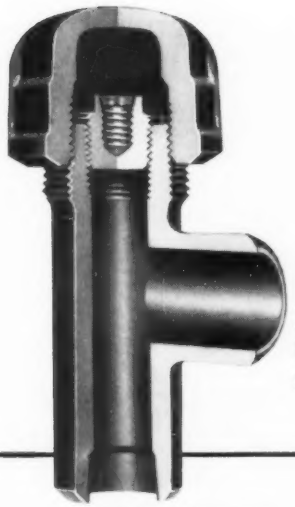

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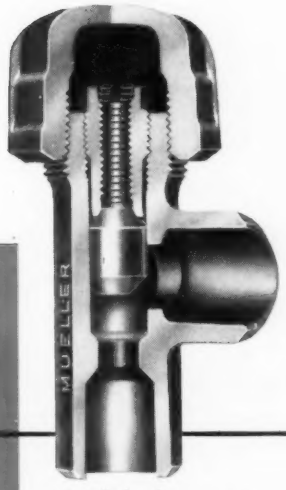

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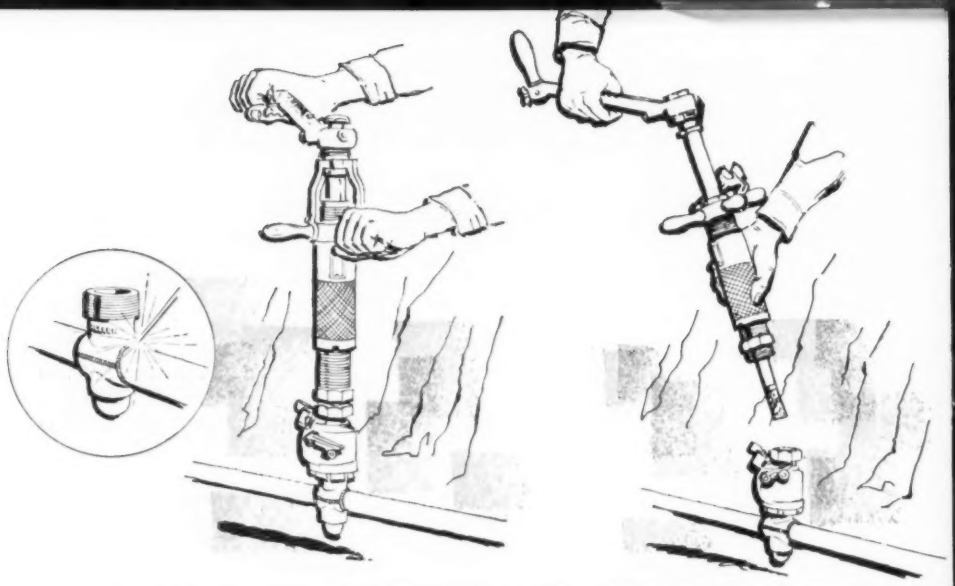

1 *drill line!*

Weld line stopper fitting to service line—at least 6" from section of line to be cut out. Attach control chamber or gate valve to fitting. Make cut through line with an E-4, EH-1, D-4, DH-2 or T Mueller® Drilling Machine.

2 *stop-off service!*

Remove drill and attach rubber stopper to boring bar of drilling machine. Remount machine and open valve. Lower stopper into fitting and expand. Gas is now shut off in service line.

Cut in curb stops Safely under pressure!

CUTTING-IN CURB STOP

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- Straight Way
- Flat or Square Head
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- Threaded Inlet with Dresser Outlet
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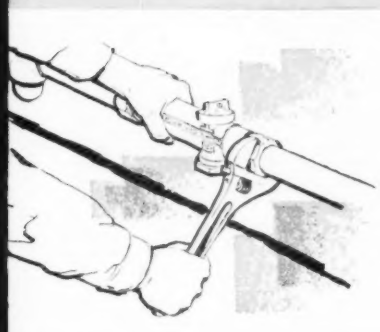
Cut out and replace leaking or frozen curb stops or install new stops in existing service lines quickly and safely without shutting off the service at the main or replacing any part of the service line.

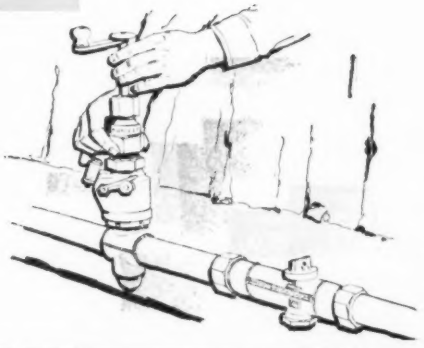
Shut-off is made right at the curb with a Mueller No-Blo® Line Stopper Fitting. A short section of line is then removed and a Mueller No-Blo Cutting-In Curb Stop is slipped into place. Only one excavation is needed!

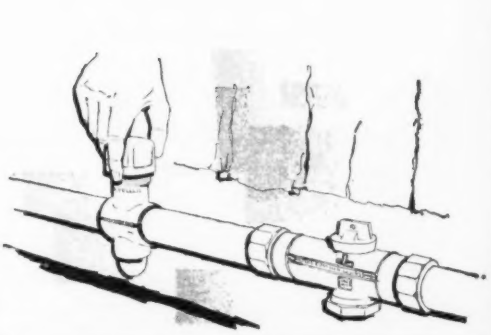
Write for the free NO-BLO® Method booklet, "Make Installations Under Pressure". It shows how other gas installations are also made in complete safety.

3 *install stop!*

Cut out short section of service line—including existing curb stop, if any. (Marks on body of Mueller Cutting-In Curb Stop indicate exact length of pipe to be removed.) Slip long end of new stop completely onto upstream section of pipe. Realign pipe and slide other end of stop as far as possible over downstream section.







4 *tighten stop!*

Downstream section of pipe now butts against inside of outlet coupling and prevents movement when stop is closed. Tighten Dresser coupling nuts firmly. (When threaded inlet stop is used, threads hold stop in position.)

5 *plug fitting!*

Close curb stop. Relax and withdraw rubber stopper from line stopper fitting. Close valve and remove machine. Mount completion machine, with plug, on control chamber or valve. Open valve and screw plug into top of fitting. Release plug and remove machine and valve.

6 *complete installation!*

Tighten completion plug and screw completion cap on line stopper fitting. Install a Mueller Curb Box over new curb stop and backfill. Entire operation has been made under pressure without blowing of gas—in a single excavation.

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WASHINGTON

Gas bill not dead—yet but it may expire soon

By NEIL REGEIMBAL
GAS Washington Bureau

GAS industry firms which contributed to efforts to pass or defeat last year's vetoed natural gas bill and deducted the donations as business expenses, are going to have to pony up more than a million dollars in extra taxes.

Firms which may support such "legislative" campaigns — even though direct lobbying is not involved — in connection with the present gas bill or any future legislation, will similarly find the government raising their tax bills.

Internal Revenue Service officials figure they will collect about $1 million in additional taxes by disallowing claims that contributions last year to the Natural Gas and Oil Resources Committee, and other similar groups, were normal business expenses.

The deductions are being turned down under provisions of the internal revenue law which prohibits such write-offs if they involve lobbying, the promotion or defeat of legislation, or for the "exploitation of propaganda, including advertising other than trade advertising." This has been interpreted as banning—for tax purposes — public relations programs and so-called "educational" campaigns where legislation or national policy are involved.

One result of last year's gas bill activities by proponents and opponents—particularly one group of proponents who precipitated the eventual veto—has been a congressional drive for tighter controls over lobbying and campaign contributions.

A special Senate committee, after 14 months of digging through lobbying and campaign records, has urged new laws to clamp tighter limits on such activities and force more publicity on them in order to "cure the evils and mischief found to exist." The proposal would also provide stiffer fines for violations, and particularly outlaw the sending of spurious telegrams to lawmakers.

* * * * *

THE nuclear electric power age should be in full swing by 1980, government power economists predict. By that time, they say, atomic electric generating capacity should reach some 227 million kw.

Most of the output of these stations will go to industry, their crystal balls tell them. A quarter-century from now, industry will be spending some $27 billion a year to buy electric energy produced by atomic reaction, they say.

By 1975, according to the experts, total electric power capacity will be three to four times what it is now, the nuclear power will account for between 20 and 40 per cent of the total.

In 1955, total electric utility capacity totaled 553 billion kw. By 1980, this figure will top 1.8 billion kw. Peak demand for electric power, which now reaches 103 million kw, should grow to 335 million kw by 1980, the prognosticators say.

Industry, which now accounts for about half of the electric energy consumed, should be buying some 808 billion kw-hours in 1980, compared with 257 billion in 1955. Residential electric users, who now account for about a quarter of total sales, will be putting out hard-earned dollars for 434 billion kw-hours, compared to 109 billion two years ago.

Commercial electric users will up their purchases from 81 billion kw-hours in 1955 to 272 billion, farmers from 26 billion to 59 billion, by 1980, they predict.

Although the government statistical experts don't say so, demand for natural gas should experience the same type of rapid growth, if government policies haven't killed the incentives for exploration or haven't subsidized competing energy sources to the point where gas has lost its inherent economic advantages.

Natural gas is now a whipping post for the coal industry spokesmen. The head of the National Coal Association, L. Newton Thomas, of Charleston, W. Va., is accusing the Eisenhower Administration of favoring oil and natural gas over coal in the competitive battle for the country's fuel markets.

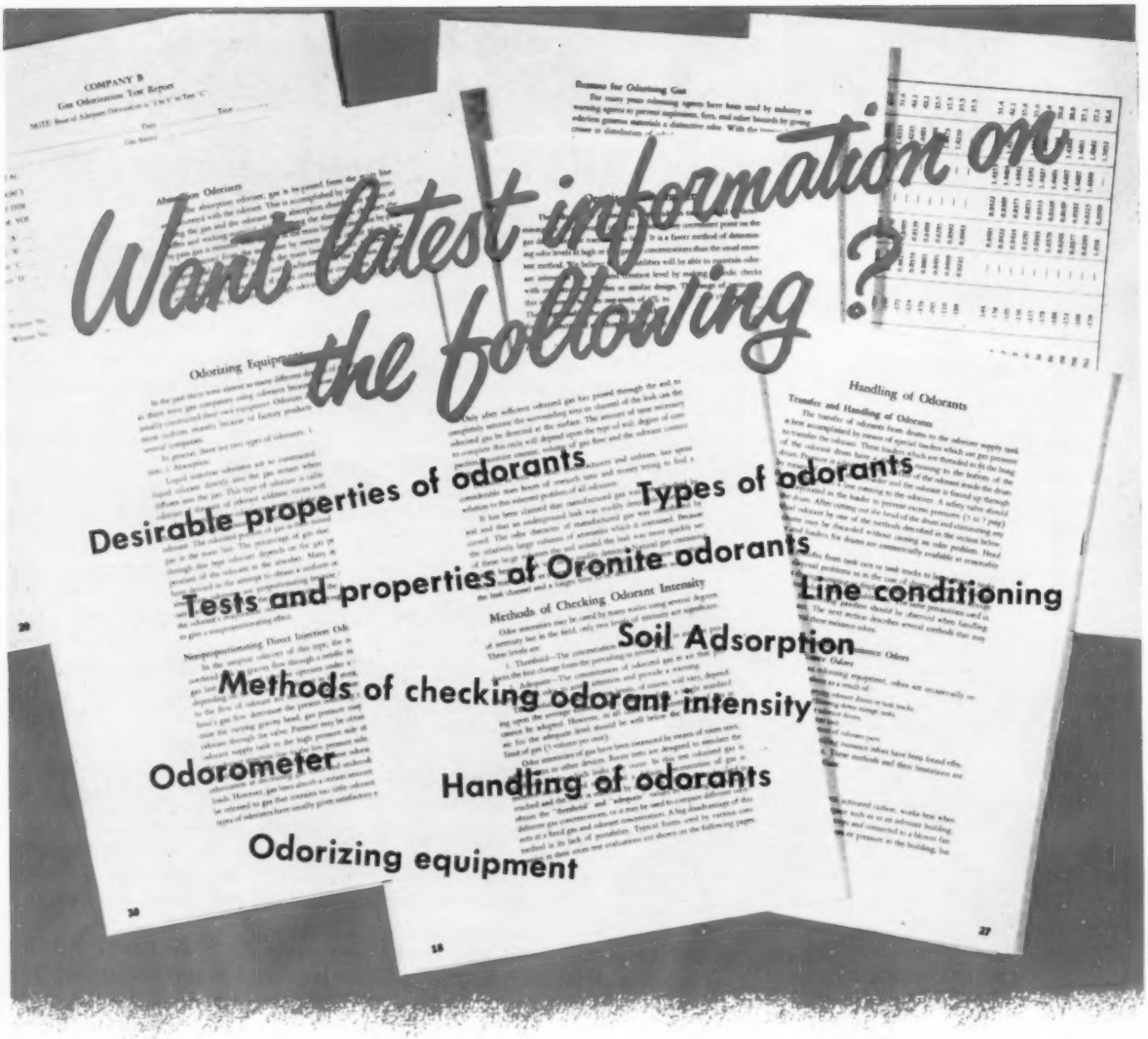
Administration policies, says Mr. Thomas, have relegated coal to a "Cinderella role," and have given it the job of a standby fuel in times of economic stress.

As examples of the "favoritism" allegedly shown natural gas and oil, Mr. Thomas cites the "more realistic" depletion allowances and a 4-cent-per-ton transportation tax assessed only on coal.

* * * * *

OPPONENTS of the natural gas bill, not as strong as in recent years but just as tenacious, are expected to try to kill the measure next year by attempting to split the ranks of the measure's supporters.

(*Continued on page* 108)



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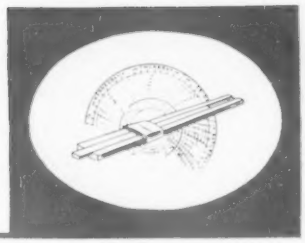


By GUY CORFIELD

Peacetime nuclear energy

In spite of the continued controversy and hestitation over private construction and operation of nuclear power plants, largely because of questions of ultimate safety and adequate liability insurance coverage, there are moves on every hand indicating that nuclear energy is becoming a permanent and expanding part of U. S. industrial and commercial economy.

In one phase several private organizations, the most recent being the Mallinckrodt Chemical Works of St. Louis, Mo., have undertaken nuclear fuel processing to supply laboratories, pilot plants, prototype installations and other small but numerous uses, and stand ready to furnish large quantities for commercial power and heating purposes when the need arises. The AEC fully endorses this development, considering that it exercises sufficient control as being the only supplier of raw materials.

Along another line the American Standards Association has organized a Nuclear Standards Board to develop standards for peacetime application of nuclear energy. This board has authorized six projects, whereby sponsors and commercial groups will study the following:

1. General and administrative standard: nomenclature, symbols, qualification of professionals, etc.
2. Nuclear instruments: specifications, methods of testing, methods of generation and application, etc.
3. Electrical requirements for reactors and nuclear power systems and generation and application of nuclear radiations: specifications, methods of testing, methods of generation and application, etc.
4. Chemical engineering in the nuclear field: methods of testing, fuel processing, treatment of foods, handling and treatment of radioactive substances, etc.
5. Reactor hazards: codes and standards concerning hazards involved in design, location, construction and operation of reactors and potential critical assemblies.
6. Radiation protection for personnel.

Oil shale and shale oil

Articles on oil shale and shale oil appear periodically in technical literature, and the potential value of this enormous hydrocarbon reserve has come into sharper focus recently because of the Middle East-Suez Canal oil supply crisis. Events appear to indicate the immediate desirability of pilot and prototype work to develop practical production and refining processes for shale oil, so that it will be ready to supplement our petroleum supply if and when needed. The shale deposits are located principally at and near the junction of Utah, Wyoming and Colorado. Most of the large names in petroleum have extensive holdings in this area, totaling many billion barrels of potential oil.

A large investment is required. It is estimated that the plant cost, to process the shale oil for refinery acceptance, is $4000 per barrel/day capacity. The shale has to be mined and crushed and delivered to retorts, which costs 50 cents to 60 cents per ton. Retorting converts the organic "kerogen" in the shale into oil, at processing temperatures of about 700°F. This oil then has to be treated to remove sulfur and nitrogen compounds, and to modify its wax-forming properties, before it is amenable to treatment by normal crude oil refinery techniques. Nevertheless it is believed that it can be delivered by pipeline to California refineries at only 1 or 2 cents per gallon higher cost than present crude oil. The U. S. Government (Bureau of Mines) has an extensive shale oil reseach plant at Rifle, Colo. Also the Union Oil Co. of California has a $7 million, 300-ton/day plant near Grand Valley, Colo., and expects to determine definitely, in about a year's time, how competitive shale oil can be with crude oil.

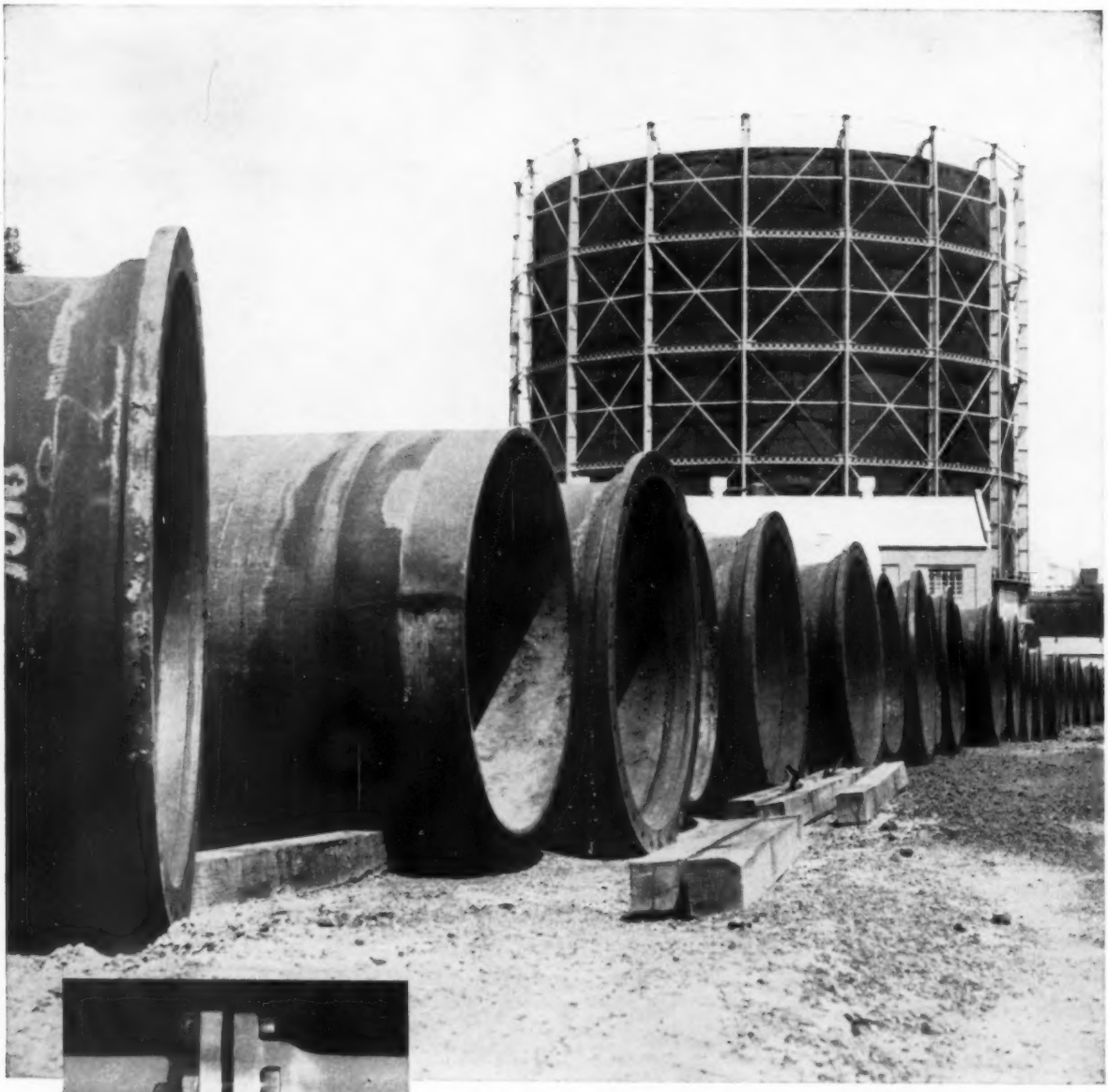
Several different ways of retorting have been developed. Union Oil uses a vertical retort, feeding the shale upward from the bottom, by means of a piston, counter-current to hot combustion gases which enter at the top; oil vapors and gas move downward, oil is condensed in the cool raw shale feed, and a mixture of oil and fixed gases is removed from the bottom. Bureau of Mines has essentially the reverse of this process in that the raw shale moves downward by gravity. A Swedish method is being considered also. In this process the ground shale is contacted, in a revolving drum type of retort, by heated steel or alumina balls. Retorting temperatures are reported varying from 900 to 1500°F.

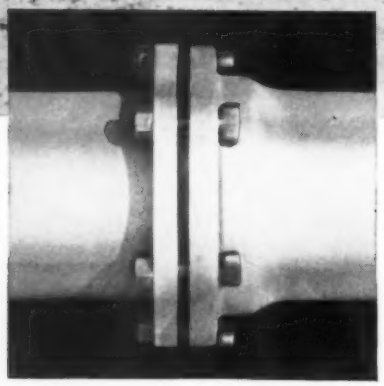
Air conditioned sidewalks

A short item in *Heating, Piping And Air Conditioning* of April 1957 describes what is stated to be the first "air conditioned sidewalks." These have been constructed in the North Towne Plaza shopping center of San Antonio, Texas. The sidewalk is 16 ft wide, enclosed with roofing at the top and glass along the street edge. The stores leave their doors open and "use the large open area in front of the door for displays."

The air cooling units are installed is several brick enclosures at the street edge. One of the enclosures also includes a 220,000-Btu boiler to supply hot water for heating coils for winter. It is stated that the volume of business in the stores has been greatly increased by this innovation.

HERE'S DEPENDABILITY





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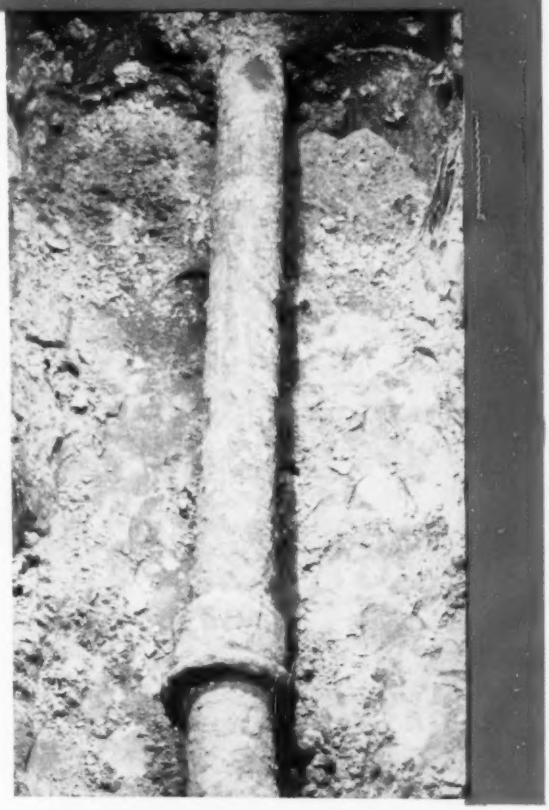
Specify cast iron pipe for your distribution mains and you can count on performance. Performance based on proof!



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109 years ago the Savannah Gas Company installed this cast iron gas main. Recently uncovered, it was found to be functioning efficiently.

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pipe FOR MODERN GAS DISTRIBUTION

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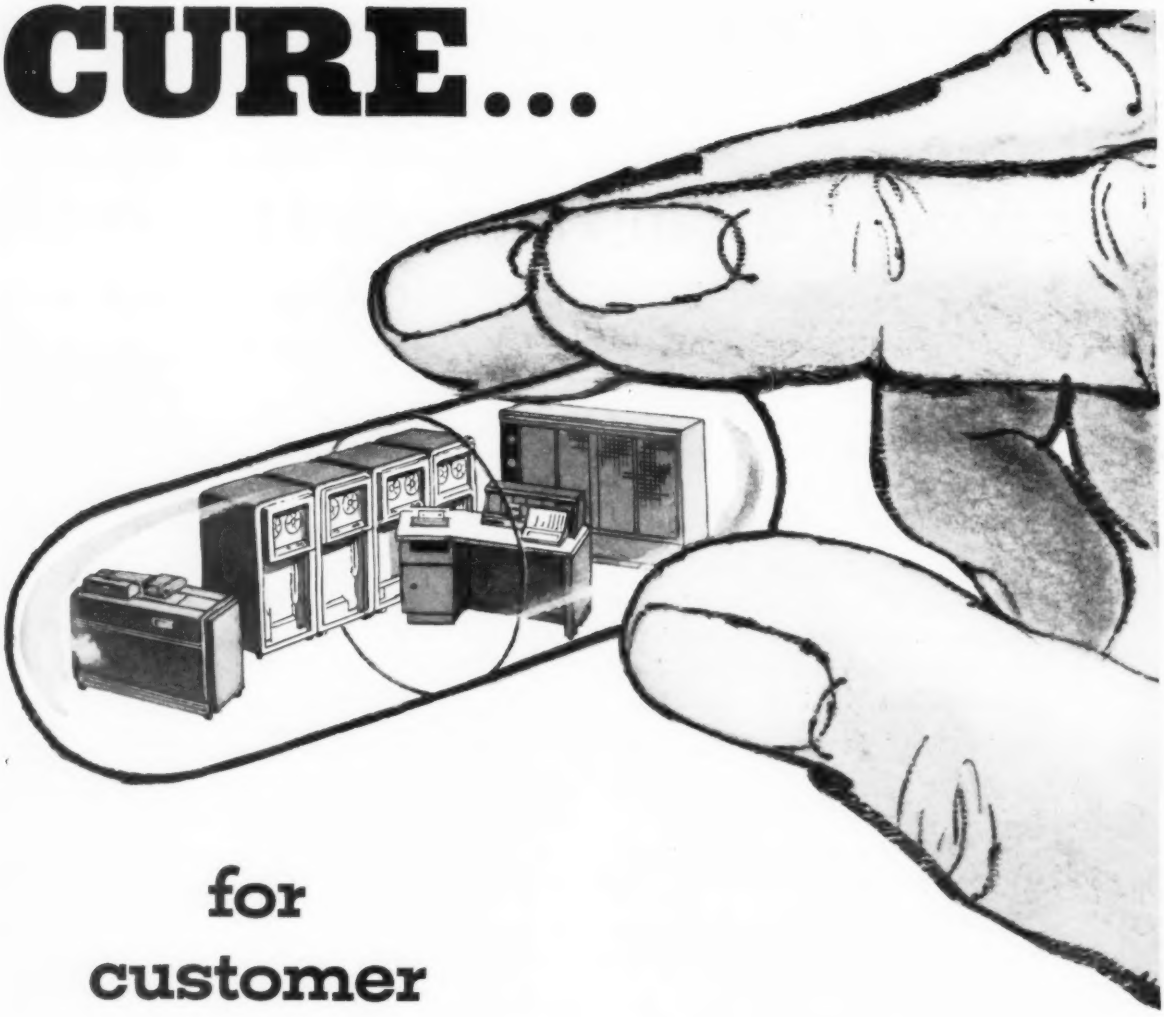

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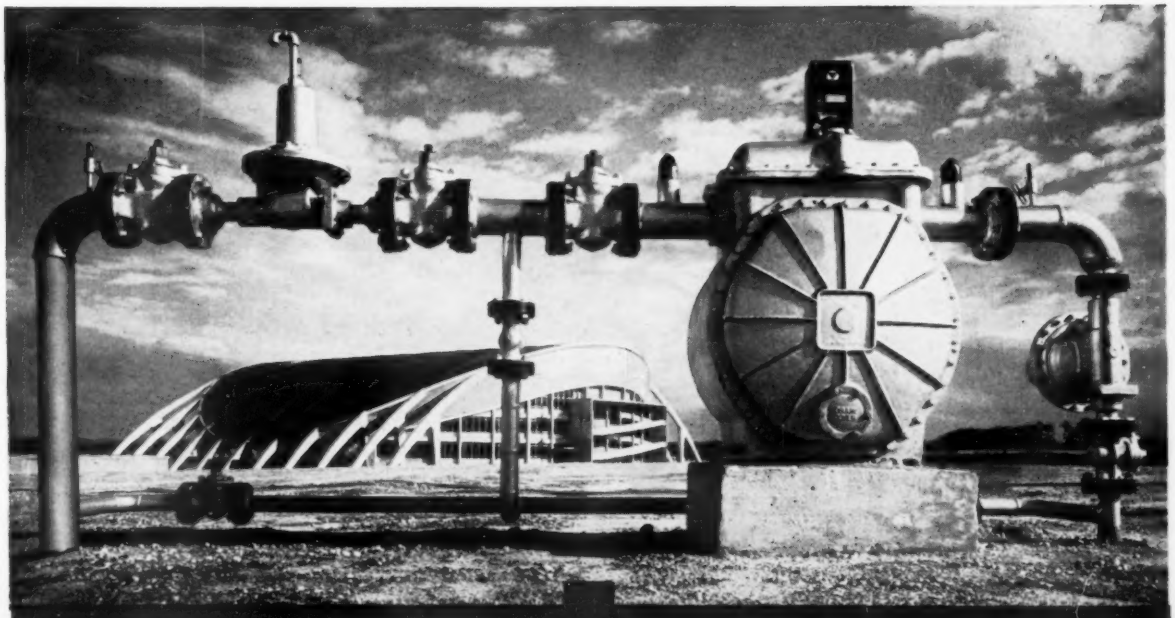

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Interior of Alabama Coliseum—this outstanding architectural achievement is heated by one of the South's largest and most modern completely gas-fired systems.

Alabama's ultra-modern State Livestock Coliseum is one of the outstanding achievements of architects and designers anywhere—providing a pillar-free open area of 7,000,000 cubic feet which required heating. Mechanical engineers selected gas both to fuel the 7 natural gas burners which provide up to 9½ million Btu's hourly and to fuel stand-by generators.

To meter and regulate the large amount of gas required for this installation, Alabama Gas Corporation turned to American Meter Company. The installation, as shown above, is a 500B Ironcase Meter equipped with a Base Pressure Index and two type "HPC" Reliance Regulators.

This natural gas user secures complete, dependable and accurate metering and regulation with American equipment, just as users of every type of gas everywhere rely on metering, regulation and control equipment made by American . . . pioneer in the use of oil impregnated bronze bearings over 28 years ago and in many other improvements for sustained accuracy at lower cost.

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HEAVIER DESIGN — Bodies are ruggedly constructed from Grade A malleable iron with reinforced sections for extra strength.

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EXTRA-WIDE, FLAT STEEL STRAPS — Forged, high-tensile steel straps are accurately shaped to conform to the outside of the pipe. Wide, flat surfaces prevent cutting or crushing of pipe.

FIT FULL RANGE OF PIPE — Dresser Service Saddles fit steel or cast-iron pipe where the OD falls within the size range marked clearly on each saddle.

Gasket of Dresser Grade 27 compound is securely cemented in place for easy installation.

Dresser Service Saddles are available in single or double strap designs.

For service connections that go in fast and easy, and give generations of dependable service, it pays to use Dresser Service Saddles. In a matter of minutes you can install a Dresser Service Saddle on steel or cast-iron pipe. The gasket of Dresser Grade 27 compound is already cemented firmly in place to make installation still easier. Saddles have exclusive plastic coating which won't "plate-out," has dielectric strength. Saddles are available in a complete range of sizes to give a "tailor-made" fit on any line from 1¼″ OD to 15″ OD. The original cost is low, and Dresser's high standards of strength and quality insure lasting performance.

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FOOLPROOF!

A compact self-contained economical regulator designed to satisfy 90% of your commercial and light industrial regulator requirements.

For distribution use, it steps up the pressure as the demand increases to deliver gas when you need it.

For safe accurate regulation of large volume commercial or industrial services, use Model 461 as a monitor regulator with Model '1100' as the control regulator. Most of the parts interchange. Both are compact, accurate and versatile.

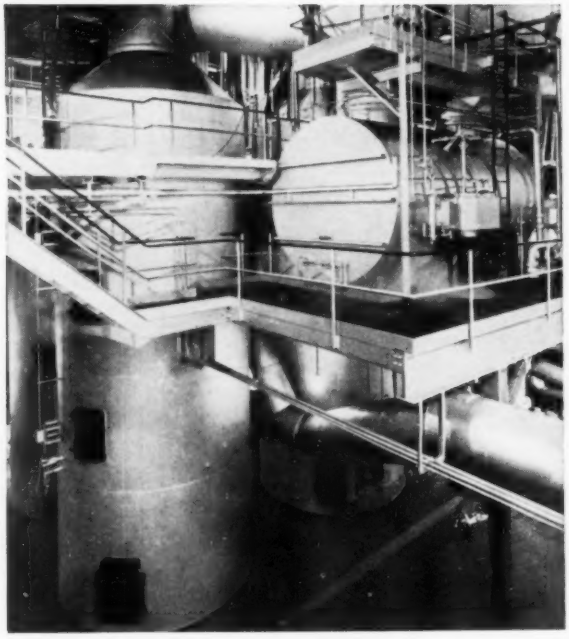
Bulletin 461 gives complete information.

461-1-56

ACCURATE CP MFG CO DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania

Peak load facilities tailored to your needs by UNITED ENGINEERS



United Engineers is uniquely qualified to help you develop the stand-by equipment you need to handle peak load demands on your plant. Our engineers are constantly investigating the latest, most promising developments in gas production processes and equipment. Long experience and purposeful research enable them to analyze your problem and come up with an effective, economical solution.

Recent peak shaving installations by United Engineers include: liquefied petroleum-air plants and thermal oil gas apparatus for light and heavy oils. We are diligently researching and improving catalytic (CCR) oil gas and other processes.

It is likely that consultation with us, combined with engineering studies, cost estimates, and efficient construction services, will be a decided help in creating the right peak load installation for your requirements. Our services and facilities are flexible.

We invite you to command them in the manner and to the degree you desire.

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

New York 17 • PHILADELPHIA 5 • Chicago 2

Our list of clients includes many of the nation's forward-thinking industries and utilities

BELIEVE IT OR NOT!

this is all you pay for a new

CASE® "320" LOADER-BACKHOE

$5,580

Complete, FOB Factory—Plus freight and taxes
(Price subject to change)

See and Compare it before you buy!

A free demonstration will quickly convince you that the new Case "320" industrial rubber-tired loader-backhoe *will outperform and outlast any competitive rig on the market.* In addition, it will save you hundreds of dollars in first cost because the entire unit — tractor, loader, backhoe, even the engine — is *built and factory-mounted by Case,* with only one manufacturing profit. There are no "hidden extras"... no messy split responsibility on warranty or service. So, by all means, if you are in the market for a wheel-type loader-backhoe, call your nearest Case Industrial Dealer. Let him *demonstrate* the advantages of the new Case-engineered, Case-built "320" — *before you buy!*

Look at the EXTRA FEATURES you get for ONE LOW PRICE!

1. Complete machine engineered and built as a HEAVY-DUTY INDUSTRIAL UNIT — not just a converted farm tractor with light-duty attachments.

2. Effortless power-steering— enables you to turn front wheels with two fingers—even when tractor is standing still.

3. High-speed shuttle transmission — lets you go forward or back up (at 27% faster reverse speeds) — without shifting gears.

4. Heavy-duty ONE-PIECE drop-forged front axle — instead of conventional three-piece axle.

5. Deep box-section hoe-boom and dipper-stick — stronger by far than competitive backhoes.

6. Hydraulic foot-pedal swing control — cuts cycle time, swings boom full 180°.

7. Extra-wide telescoping stabilizers — anchor tractor firmly on hillsides and when digging hard ground.

8. Husky ½-yd. loader bucket — has automatic power-leveling, 60° grading angle.

9. Cushioned backrest seat (instead of steel "plow-bucket") — flips over instantly for operating backhoe or loader.

NOTE: These are just a few of *more than 35 exclusive features* you get with the Case "320" wheel-type loader-backhoe.

CASE INDUSTRIAL®

1st in Quality
for over 100 years

Clip ... mail for quick action

J. I. CASE CO., Dept. H1397, Racine, Wis., U.S.A.

☐ Send full details on Case "320" Loader-Backhoe

☐ Send name of nearest Case Industrial Dealer

Name_____ Position_____

Company_____

Address_____

City_____ State_____

C-BL-60

Installing 12" Mechanical Joint cast iron pipe gas main in New Jersey.

America's oldest pipe is its newest

Cast iron pipe's ability to serve for centuries is well known. Cast iron mains laid by 40 American gas utilities over a century ago are still serving; hundreds of others have been in service 50 years and more.

Impressive as this record is, cast iron is not content to rest on it. Today's modernized cast iron pipe, centrifugally cast by advanced metallurgical techniques, is even tougher, stronger, more uniform. More dependable . . . better able than ever to deliver the long life and long-term economy a gas installation requires.

You specify wisely when you specify cast iron pipe.

You Can Rely On Cast Iron Pipe

- Standardized mechanical joints are bottle-tight for usual gas pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortage. Cast Iron Pipe is available.

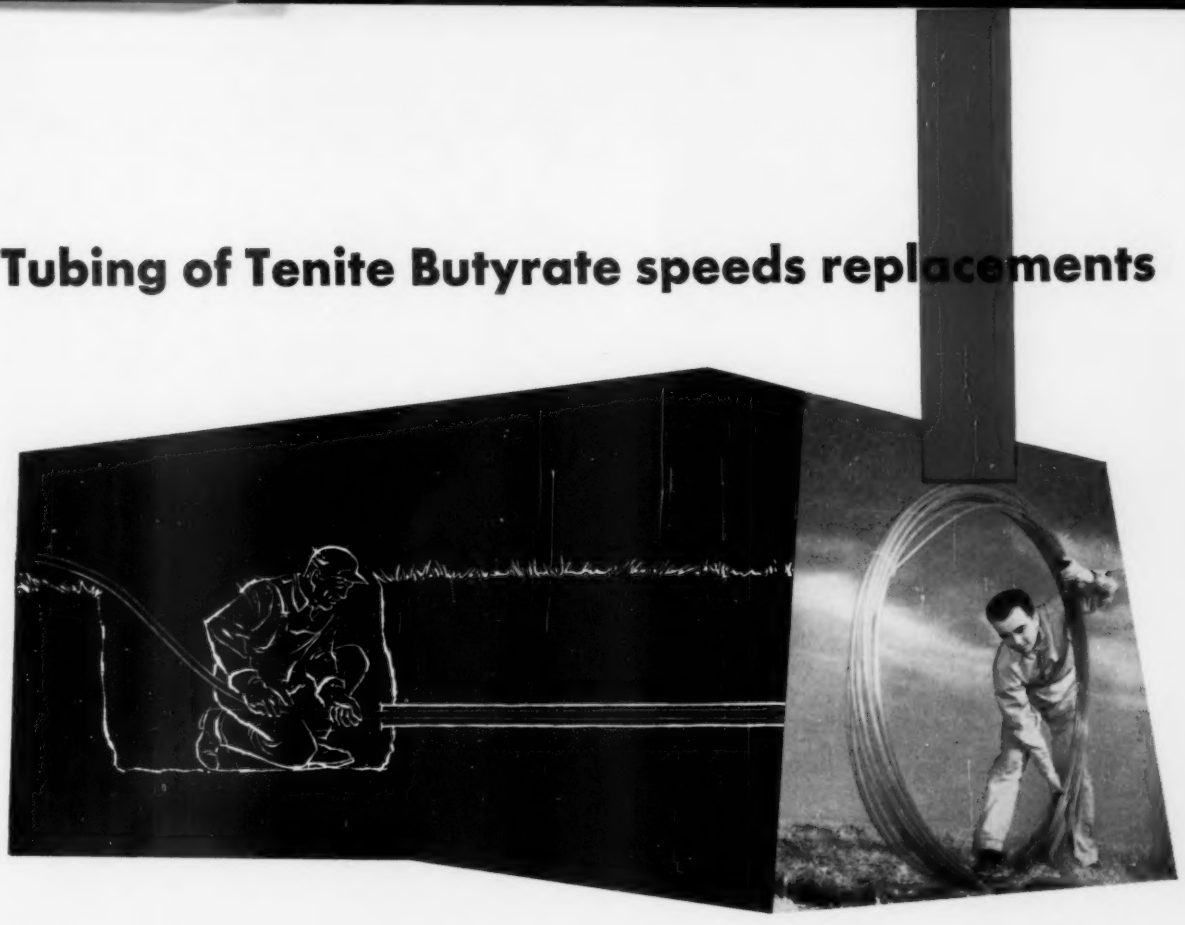
U.S. cast iron PIPE

CAST IRON

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

Tubing of Tenite Butyrate speeds replacements



You dig two holes instead of a ditch

Replacing corroded service lines is a much simpler operation when using plastic tubing of Tenite Butyrate. Trenching is eliminated—since holes are dug only at the main tap and service riser, with the new flexible tubing being run right through the old pipe.

Customers prefer this method because it saves their lawns and paved areas.

Field crews prefer this method because tubing made of Butyrate is light and easy to handle.

The entire length of tubing required for an average service of 70 feet weighs less than four pounds. Joints need no asphalt protection and simple adaptors make connections between tubing and metal pipe. What's more, tubing of Tenite Butyrate is not subject to the corrosive and electrolytic attack of the soil, assuring many years of trouble-free service.

Since 1943, tubing of Tenite Butyrate has been a familiar friend to the gas industry—cutting installation time for service replacements and for new services as well. One company has already installed nearly 3,000,000 feet of tubing made of Tenite Butyrate. More recently, several progressive utilities have also installed *mains* of Tenite Butyrate.

Discover how this versatile Eastman plastic can help you in your operations. Send for literature describing the tubing, its fittings, and installation methods in natural gas service application. Ask, too, for the names of suppliers near you handling tubing of Tenite Butyrate. Write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

TENITE
BUTYRATE
an Eastman plastic

Get time-proved pipe facts— Make your own comparison

After careful comparison, the facts will show that American Cast Iron Pipe excels for gas service. In large or small diameters, this rugged, high-strength material provides the longer life that means greater over-the-years economy . . . lower annual cost.

Manufactured with the original standardized mechanical joint designed specifically for gas service, American Double-X Cast Iron Pipe, since its introduction, has been the first choice of engineers and officials for hundreds of gas transmission and distribution installations.

Compare the economy and dependability of American Cast Iron Pipe with that of any other pipe. Call the American Cast Iron Pipe Company representative near you to get time-proved facts for your comparison.

Installation of large diameter American Double-X Cast Iron Pipe at a Midwestern gas utility.

AMERICAN
CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

SALES OFFICES

Kansas City • Orlando
Minneapolis • Cleveland
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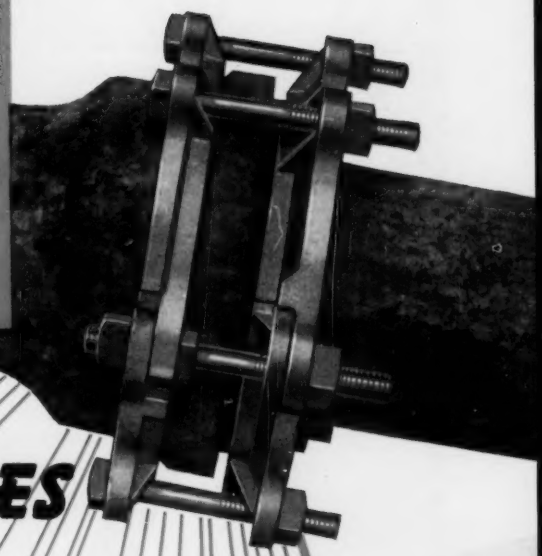
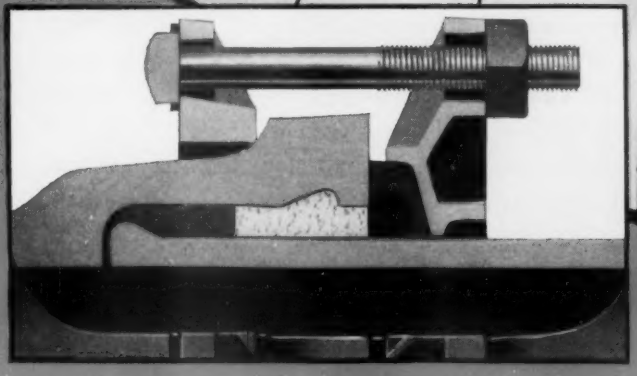
JOSLYN
BELL JOINT CLAMP*

For Permanent Repair of Bell and Spigot Joints



NOW—AVAILABLE AT ALL JOSLYN WAREHOUSES

JOSLYN—FOR 55 YEARS LEADING SUPPLIER OF CONSTRUCTION MATERIALS TO THE ELECTRICAL POWER AND COMMUNICATION UTILITIES



EASY TO INSTALL
Extra Heavy Malleable Iron, Segmental Clamping Rings—only a few simple, large parts to assemble

EFFECTIVE
Combination gasket provides early seal-off and high factor of safety—Rugged design prevents distortion of castings

PERMANENT
Harder rubber gasket shell prevents cold flow and maintains high continuous packing pressure —insures permanent tight joint

AVAILABLE AND ECONOMICAL
Readily available at all Joslyn Warehouses—low in price—permanent repair

*Patents Pending

JOSLYN
MFG. AND SUPPLY CO.
WM. E. PRATT FOUNDRY DIVISION
155 North Wacker Drive, Chicago 6, Ill.

Naugatuck KRALASTIC

non-corrosive KRALASTIC curb and cathodic terminal boxes

A unique rubber-resin blend, Naugatuck's Kralastic® is now used in extension-type Curb Boxes and in Cathodic Terminal Boxes*. Why in Curb Boxes? Because Kralastic can't corrode; it permits the telescoping section to collapse when necessary. Why in Cathodic Terminal Boxes? Because Kralastic permitted design changes for more simplified testing. In both instances, the non-corrosive character of Kralastic eliminates the nuisance of hard-to-remove caps.

Kralastic offers superior physical properties that no other material can match. It can't rust or rot. It is lightweight, about 1/7th the weight of iron. It is free from electrolytic action and impervious to water and soil elements.

Kralastic has proven its superiority for use in pipe, fittings, conduits, etc.—in fact, wherever severe corrosive conditions limit the life expectancy of metals.

For more information about this tough and durable plastic material, why not write to us on your company letterhead.

*Kralastic Extension Type Curb Boxes and Cathodic Terminal Boxes are fabricated by HANDLEY-BROWN HEATER CO., Jackson, Michigan.

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N.C. • Chicago • Los Angeles • Memphis • New York • Phila.
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NEW WAY
To End Clogged Pilots In Natural Gas Lines
TEST IT AT OUR EXPENSE
HOME GAS FILTER
DOLLINGER
PROTECTOMETER
STAYNEW
FILTERS
MODEL
CPHB-S-D-75
MADE IN ROCHESTER, N. Y. U.S.A. BY
DOLLINGER CORPORATION
FILTER SHOWN ACTUAL SIZE

Biggest News

EFFICIENT • SAFE • LOW COST

FIELD TESTED • 3 Times more filter area

Here's the most economical way to remove dirt, pipe scale, and other foreign matter from natural gas lines, and keep your customer's appliances operating efficiently.

EXCLUSIVE RADIAL FIN DESIGN

The new Staynew Home Gas Filter gives you 72 sq. inches of filtering area . . . 3 times as much as competitive filters! This means you can establish longer intervals between cleanings . . . a substantial consideration when you figure the average service call costs $4.00.

DESIGNED FOR MAXIMUM SAFETY

You do not "break" the line for cleaning. Once the new Staynew is installed it stays in the line permanently. Cleaning is accomplished by removing a single bolt as shown at right. For additional safety, the filter is arranged so that a Utility seal can be applied. To eliminate unnecessary threaded joints, or stepdowns, the Staynew is available with either ¾″ or 1″ female threaded inlet and outlet. Other sizes may be ordered on request.

FIELD TESTED FOR 2 YEARS

Trial installations and exhaustive tests of this new filter have been successfully completed by 10 Utilities during the past two years.

SIMPLE CONSTRUCTION

Consists of only six parts assembled by a single bolt. The casings are die-cast aluminum and an O-ring gasket fitted in a special groove in casting head assures an absolutely tight seal. The unit is designed for 125 psi pressure. It has a capacity of 600 scfh with an initial pressure drop of only 1″ of water when the operating pressure is 6″ of water. A new filter material called Feltex-40 provides greater efficiency . . . stops all particles from 5 microns up.

Thousands already installed by

PORTLAND GAS AND COKE CO.

Portland Gas and Coke Company installed the new Staynew Home Gas Filter in thousands of Oregon homes. They report as follows:

"The Dollinger Staynew Home Gas Filter has helped us keep service calls to a minimum. With this filter right in the home we are sure to stop more dirt and thus eliminate the major source of clogged pilots."

Specifications

Construction: Die-cast aluminum base and head held together with single locking bolt, washer, and gasket.

Overall Dimension: 5 ¼″ high, 4 ½″ diameter.

Capacity: 600 scfh with initial pressure drop of 1 inch of water.

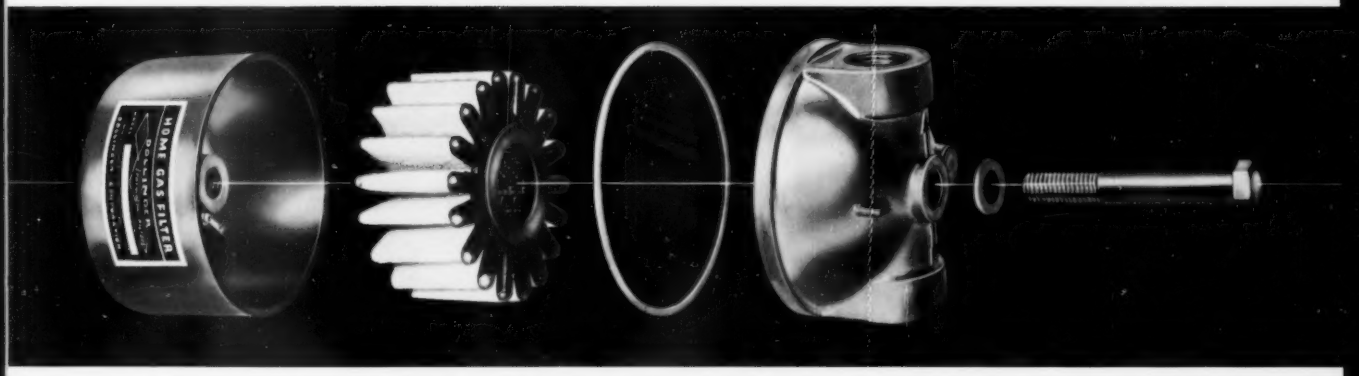
Design Pressure: 125 psi.

Installation: Upstream from meter on low-pressure systems; downstream from meter in front of regulator on high-pressure systems.

Sizes: ¾″ and 1″ female threaded inlet and outlet. Other sizes available on request.

In Home Gas Filtering...

STAYNEW MODEL CPHB



Free Trial Offer

Obviously, you are not going to install these new filters without first testing them yourself. That's why we'd like you to accept our offer to give you a Staynew Home Gas Filter FREE, and without obligation. You can test it anyway you like, and see for yourself its many advantages. All we ask is that you write us on your company letterhead so we are sure that the filter goes only to authorized personnel. Address: Dollinger Corporation, 56 Centre Park, Rochester 3, N. Y.

WANT MORE DATA?

MAIL THIS CARD TODAY

Postage Will be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 245, Sec. 34.9 P.L. & R, Rochester, N.Y.

DOLLINGER CORPORATION
56 CENTRE PARK
ROCHESTER 3, N.Y.

Utilities Use Many DIFFERENT STAYNEW FILTERS

Model CPHG Gas Filter

Model AAPHS Absorption Filter

Model D Intake Filters FOR COMPRESSORS

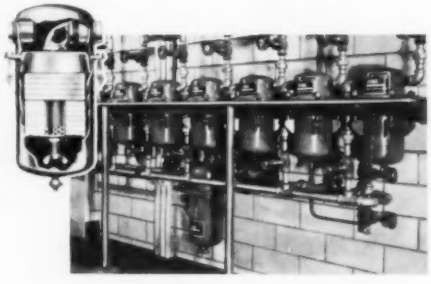
Model CPHG GAS FILTER

Gas Filters have radial fin construction. Used by utilities to stop rust, scale and moisture from entering regulators and pilots. Also, used in natural gas lines for removing anything from dry oxide dust to oily deposits left from fogging and pumping operations.

Charles H. Gueffroy, left, President of Portland Gas & Coke Co., and Carl E. Braun, Vice-President of Publishers Paper Co., Oregon City, Ore., "Turn on the Gas" at the latter's plant. Two 6-inch Staynew Model CPHG Gas Filters are shown in foreground.

Model AAPHS ABSORPTION FILTERS

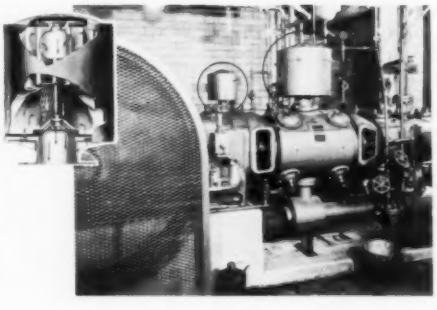
Absorption Filters are used wherever mechanical or manufacturing processes require removal of the last traces of oil or water from operating air or gas.



A bank of Staynew Model AAPHS Absorption Filters used on supply air for pneumatic controls at Rochester Gas & Electric Co., Rochester, N. Y.

Model D INTAKE FILTERS FOR COMPRESSORS

Another application of Staynew Filters in Utility Companies is this Dry type Intake Filter. They are used to protect engines, compressors, and blowers from dust, soot, dirt, and other abrasive impurities. Models available for all capacities from 5 CFM to 10,000 CFM.



Circled are Staynew Model D Intake Filters installed on compressors whose output is used to remove soot from walls of boilers and keep slag off the arches and passes where accumulations might seriously hamper boiler efficiency. Each filter has 350 CFM capacity.

DOLLINGER CORPORATION, ROCHESTER 3, N.Y.

PLEASE CHECK:

- ☐ Staynew Gas Filter Bulletin 290-R
- ☐ More information on new Home Gas Filter Model CPHB (Note: for free filter, please write on company letterhead)
- ☐ Have Dollinger Representative call.
- ☐ I have a specific filtration problem. Watch for my letter.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Write for more information on any of the Dollinger Staynew Filters illustrated. And remember, Dollinger engineers will be happy to help you with your filtration problems. Use the postcard for convenience.

DOLLINGER STAYNEW FILTERS

NOW

Another New and Bigger Forward Control 'Jeep' Truck

Here's the bigger, more powerful, 7,000-pound GVW Forward Control 'Jeep' FC-170 Truck:

- **Advanced Forward Control design!** The same new, advanced features that made the Forward Control 'Jeep' FC-150, an immediate success.
- **More cargo space on less wheelbase!** A 9-foot flatbed pickup box on a wheelbase only 103½-inches long! Bed is 27-inches from ground for back-saving ease of loading!
- **More efficient space utilization!** Compare it with any other 4-wheel drive truck — *only* the FC-170 gives you so much cargo space per inch of wheelbase!
- **All-time high for "big-load" maneuverability!** The FC-170 is the *only* 4-wheel drive truck to give you "go-anywhere" 'Jeep' maneuverability with a payload capacity of up to 3500-pounds.
- **Other outstanding features!** It's really a 4-wheel drive truck — *not* a modified 2-wheel drive truck, *not* a conversion! High-torque Hurricane 6-226 engine, time-tested and performance-proved • spacious Safety-View Cab • big wrap-around windshield • wide 63-inch tread for ground-gripping stability in off-road travel • shifts easily into 2-wheel drive for highway travel • with power take-off, operates a wide range of special equipment from winches to belt-driven machinery.

The newest addition to the 4-Wheel-Drive 'Jeep' family...ready for the bigger, tougher jobs!

SPACIOUS SAFETY-VIEW CAB puts you in a "Forward Control" position, gives you greater command of any driving situation.

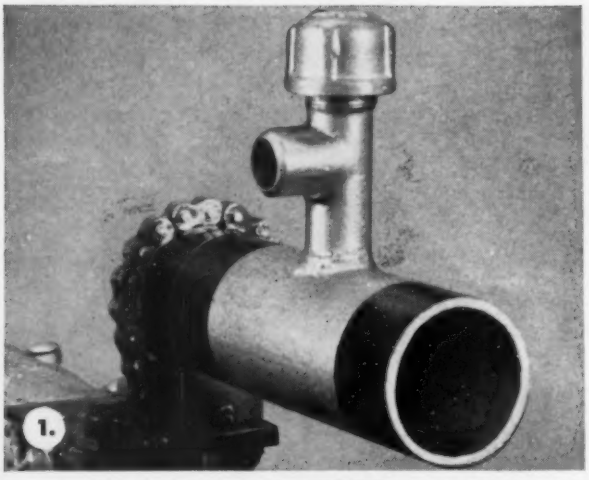
EXTRA 4-WHEEL-DRIVE 'JEEP' TRACTION takes heavy loads to off-road areas impossible for ordinary vehicles to reach.

'Jeep' Forward Control
4-Wheel-Drive
FC-170

WILLYS... world's largest manufacturers of 4-Wheel-Drive Vehicles

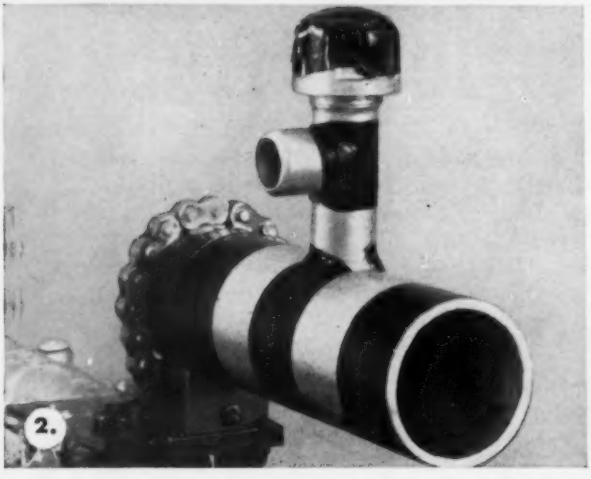
Willys Motors, Inc., Toledo 1, Ohio

The tape that fits to a "T"



A remarkable ability to conform to irregularly shaped contours . . . plus all the advantages of polyethylene

Three easy steps in wrapping a T-joint with *Polyken* Polyethylene Tape No. 940. Note the way this highly conformable tape adapts itself to every twist and turn.



If you have pipe contour problems, this one's for you. Where you need it, it's a valuable new companion product to *Polyken* No. 900 polyethylene tape coating—the ideal coating for straight-pipe runs.

Polyken No. 940—is made especially for use on valves, fittings, ells, T-joints and other irregularly shaped pipe connections. All the superb corrosion resistance of polyethylene . . . plus an extremely high degree of conformability.

No. 940 is a truly balanced product which offers the right combination of elastic memory and dead stretch. Financially, it can mean a nice saving on maintenance.

We'll be glad to figure application costs on your job. Write, wire or phone today: The Kendall Company, Polyken Sales Division, Dept. G-H, 309 W. Jackson Blvd., Chicago 6, Illinois (WEbster 9-7100).

Complete catalog, Sweet's Industrial Construction File, Sec. 3J/Ke

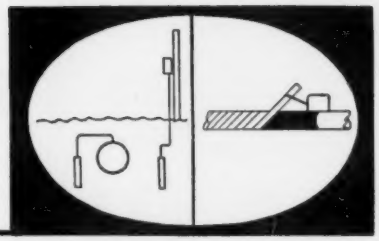
Polyken®

PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

Corrosion Prevention

DISTRIBUTION • TRANSMISSION



By Marshall E. Parker

Pipeline resistance to earth

IN the evaluation of coatings, the application of cathodic protection, the testing of insulated joints, and several other phases of corrosion control on pipelines, the quantity "resistance to remote earth," as "seen" from a single point, is of interest. Sometimes it is useful to estimate this value from the electrical characteristics of the line, sometimes the resistance is measured directly, and used to determine other quantities. In either case, it is essential to be able to express the mathematical relationships between the various quantities.

The resistance to remote earth of a line as seen from a single point, is determined by three things: (a) the length of the line, (b) the longitudinal resistance of the pipe, and (c) the unit leakance of the pipe to earth. Various units of length are used by different writers; the present discussion will use the foot.

The longitudinal resistance of the pipe is determined by its weight and the material of which it is made; this quantity is expressed by "r" and is in "ohms per foot." The leakance to earth is determined by the kind, quality, and condition of the coating, if any; the resistivity of the soil; and the "contact resistance" which may be modified by cathodic protection or by corrosion currents. The resistivity of the soil immediately adjacent to the pipe is of most importance, but the leakance is affected by more remote soil as well; the total effect is an average, but not one capable of precise mathematical definition. Instead of the term leakance, "leakage conductance" is more commonly found in corrosion writing; this quantity is expressed by "k" and is in "mhos per foot." The separate effects of coating conductance, conductance through holidays, soil resistivity, and polarization, cannot in general be determined; only the combined effect is seen.

The "attenuation constant," which expresses the rate at which potentials and currents vary along the length of the line, is derived from "r" and "k" by the expression

$$a = \sqrt{r/k} \qquad (1)$$

The units in which "a" is expressed can only be "per foot."

If any two of the three quantities in equation (1) can be measured, the third can be computed. The longitudinal resistance "r" can be measured with an accuracy of 1 per cent, but will be found to vary as much as 5 per cent on nominally uniform pipe, due to permissible variation in pipe weight. The leakage conductance "k" is subject to much wider variation, and can rarely be measured with an accuracy better than 50 per cent. This is to be expected in view of the large variability in soil and coating, and of the random distribution of holidays.

When an infinitely long line is "seen" from one end, the resistance to remote earth is given by

$$R = \sqrt{r/k} = r/a = a/k \qquad (2)$$

R is expressed in ohms. The three expressions given are equivalent. When an infinitely long line is "seen" from a central point, the total resistance is that of two such lines in parallel; i. e., one-half the above expression.

When a line of finite length "L" is seen from one end, the resistance is given by

$$R = \sqrt{r/k}\ \coth(aL) = r/a \coth(aL) = a/k \coth(aL) \qquad (3)$$

As with equation (2), all three of these expressions are the same; they differ from those in (2) by the factor cot h(aL), which is the hyperbolic cotangent of aL. This function is not usually found in tables, but may be obtained from

$$\coth(aL) = \cosh(aL)/\sinh(aL)$$

It will be noted that for large values of aL, cot h(aL) becomes approximately equal to one; that is, very long lines behave as if they were infinite. The total resistance to earth of any line, seen from a central point, whether it is finite or infinite in one or both directions, is obtained by first computing separately the resistance in each direction, and then paralleling the two values.

For estimating purposes, the longitudinal resistance "r" of a welded steel line may be approximated by

$$r = 1/3940\ W, \qquad (4)$$

where "W" is the pipe weight in pounds per foot. The constant 3940 is actually a function of the pipe material, but the value given is sufficiently close for most pipe steels.

The range of the other principal variable "k" is much greater. It may be approximated by the expression

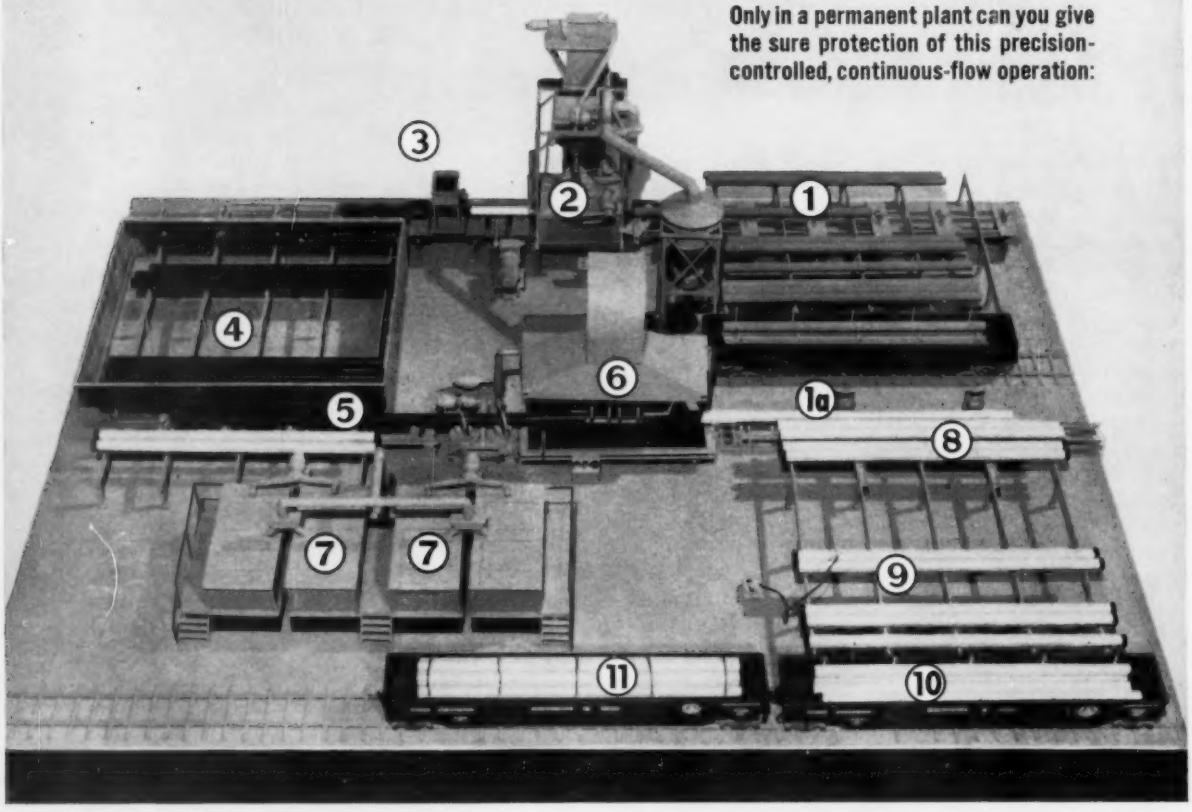
$$k = d/Q\rho, \qquad (5)$$

where "d" is the actual outside pipe diameter in inches, "Q" expresses the quality of the coating,

(*Continued on page* 110)

CONTINUOUS FLOW
makes this a model pipe wrapping plant

Only in a permanent plant can you give the sure protection of this precision-controlled, continuous-flow operation:



1. Caustically-cleaned pipe enters plant from yard.

1a. Bare pipe is unloaded direct from car in plant.

2. Roto-grit blaster removes all trace of rust, mill scale.

3. Machine applies primer.

4. Primer cures in heat room.

5. Automatic conveyor delivers pipe to—

6. Coating and wrapping machine.

7. Automatic kettles flow enamels to coating and wrapping machine.

8. Coated and wrapped pipe is delivered to an electronic-inspection area.

9. Holiday detector inspection area.

10. Pipe is loaded on flat car, according to specification MD-4, developed by Hill, Hubbell and given to the Association of American Railroads.

11. Permanently protected pipe awaits delivery to the job.

Specify Hill, Hubbell wrapped pipe on your next job

HILL·HUBBELL & COMPANY

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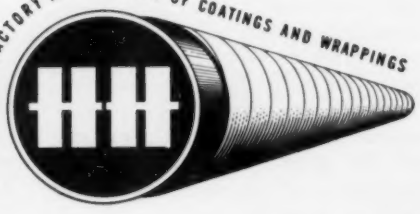

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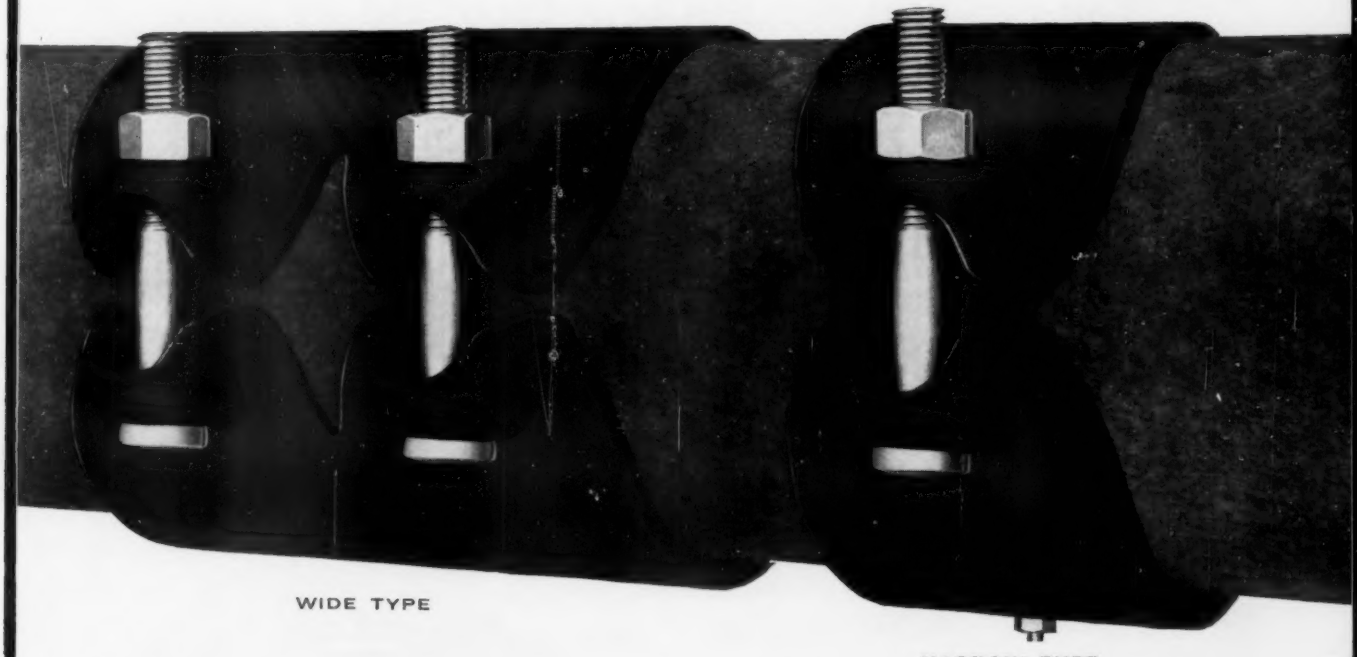

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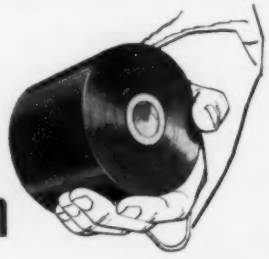

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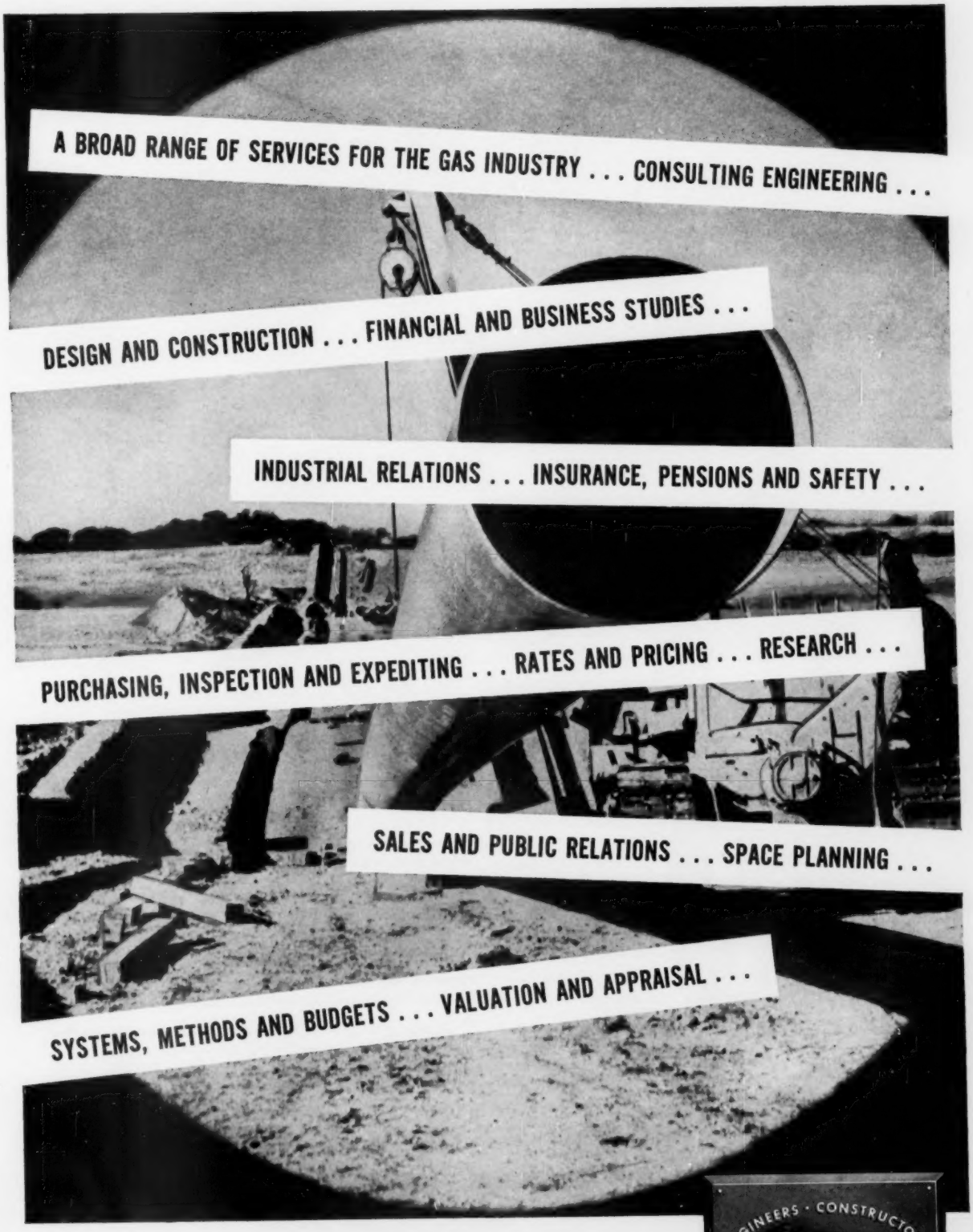
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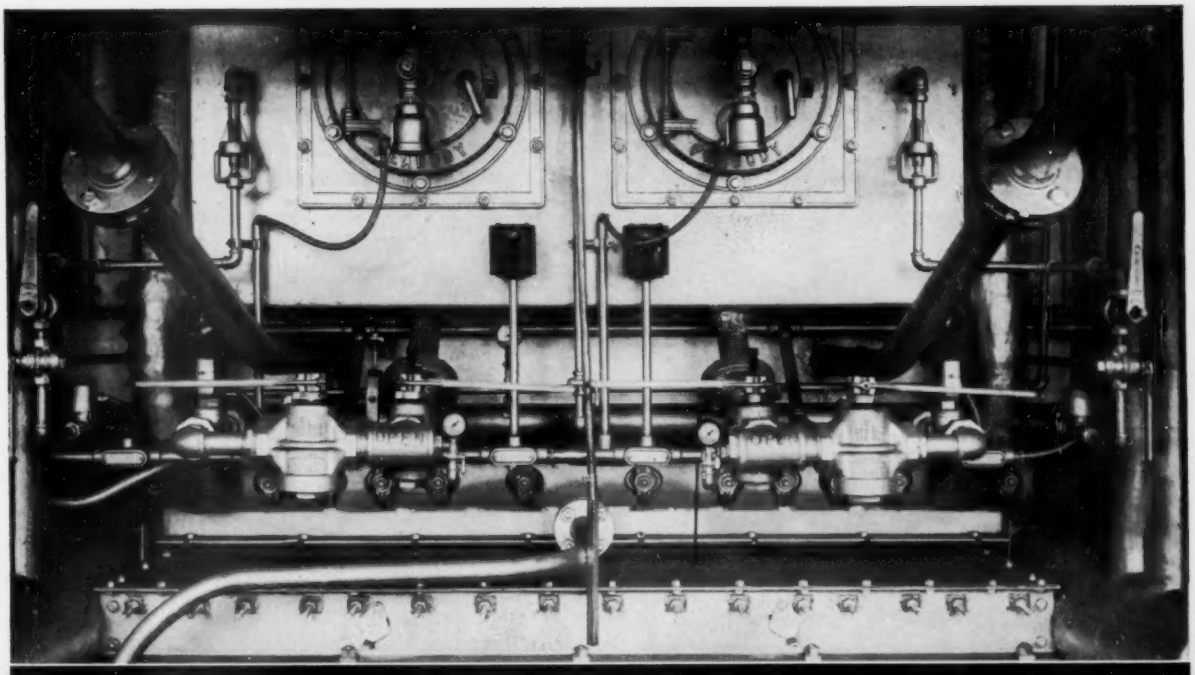

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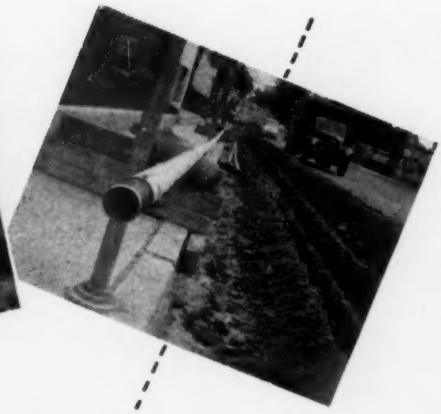

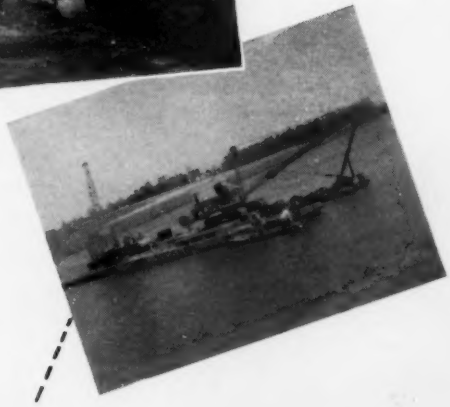

Trans-Canada

. . . The story of turmoil, tenacity, and triumph

By J. FRED EBDON, Editor

FLAMES are visible energy. Such energy can quickly be changed to power. Industrial enterprise turns power into a nation's strength.

Three flames have become marker beacons in the progress of Trans-Canada Pipe Lines Ltd. The first flame was touched off in 1883 by Canadian Pacific Railway engineers. The steel of this railroad

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GAS

AUGUST 1957

then being muscled across Canada had reached a point 25 miles northwest of Medicine Hat, Alberta. The wood-burning locomotives needed a new water supply. A water well was drilled. But, to the disgust of the railroaders, at 1155-ft TD, natural gas was hit. The well caught fire and burned down the drilling rig. Thus, the first natural gas well in Alberta was really a sleeper.

Seventy-three years later, in mid-May of 1956, Ottawa was the scene of the second beacon flame. Emotions of Tory and C.C.F. (socialist) leaders commingled with those of in-power liberals. Friction caused the emotions to burst into flame, setting off a history-making Parliamentary joust over bringing Alberta natural gas to Canada's eastern markets via a long-stalled pipeline project.

The third flame has not been ignited. This marker beacon will be the millions of natural gas flames that will be burning through Trans-Canada Pipe Line's new transmission system. It is very close to ignition today.

Many of us in the natural gas industry have failed to appreciate the vital part Canada is playing in the North American energy supply. Some know little or nothing about Canada in general. Similarly, many Canadians fail to understand the United States. In fact, it is an odd truth, that these two countries, bound together geographically, and so interdependent on each other, often regard the other and his views as completely foreign.

Actually, Canada and the United States have much in common. Both countries are in the New World and share North America. The peoples spring from common lines. Both peoples pride their freedom and make sallies in its defense. Both Canadian and United States Americans are probably not as free as they protest.

Canada is a big country. Bigger than the United States — even larger than Texas. But, only 16 million souls populate its 3.5 million square miles. And 90 per cent of these Canadians huddle against the United States, within 200 miles of the U. S. border. North of this 200-mile wide zone that parallels the U. S.-Canadian border, lies latitude 55 and the fast developing, Northland. Two-thirds of Canada's terrestrial extent is in this uncompromising—but rich in resources—Arctic influenced climate. So Canadians huddle near the U. S. due to climatological influences rather than any other attraction.

Actually, until the Yukon and Northwest territories are reached, Canada is very similar to the United States. The border is, after all, mostly an invisible line drawn across North America. They have the Rockies, great stretches of desert-like plains, grain-growing prairies, and self-styled sophisticated eastern provinces. The people are very much like us—Canada is another melting pot to which men have been drawn by freedom and opportunity.

Above all, there are two points that should be considered and remembered to fully understand Canada:

1. It is an awakening giant among nations that has within its boundaries more potential wealth and more natural resources (mostly untouched and undeveloped) than any other nation on the globe—with the possible exception of the USSR, about which we do not know much and have few standards for measurement.

2. The mild-weather belt—within 200 miles, say, of the U. S. border from coast to coast—is not a wilderness. This section is both well industrialized and heavily cultivated. Canada is an industrial frontier in relation to its vast potential, but right now it is the sixth largest manufacturing country and the third largest trading nation. More Canadians are at work in manufacturing than in agriculture, mining, fishing, public utilities and finance combined.

So we have Canada to our north that has taken her place in industry and commerce. Her people speak our language, she offers equal if not greater security and opportunity. Lastly, Canada has the natural resources—in all their forms—to carry her to the very front in industrial development.

Canada has refuted the philosophy of Voltaire. That satirist stuck his foot in his mouth by stating before the battle of the Plain of Abraham—near Quebec City—that: "Two nations are at war for a few acres of snow in Canada." How wrong can one be?

Key word in Canadian distribution companies is EXPANSION. Here, the word is translated into action to bring natural gas to homes previously without this modern, economical service.

PROJECT

The pipeline is a big one

TRANS-CANADA PIPE LINES LTD. is building a 2294-mile big-inch pipeline. It will be the world's longest natural gas trunk line. Natural gas from western Canada will be brought to market in population and industrial centers of eastern Canada. Markets along the route of the pipeline will be served.

The mainline begins just west of the border of the provinces of Alberta and Saskatchewan. Provinces of Saskatchewan, Manitoba, Ontario, and Quebec are passed through in that order. The line terminates at Montreal, Quebec. It will stimulate Canada's industrial strength, which will enhance economic independence. Both will, in turn, further develop Canada's international life in the community of nations.

Trans-Canada pipeline is a big one. The pipeline industry throughout the world has rarely, if ever, seen engineering, financing, and construction on the scale of this project. It has been compared with the St. Lawrence Seaway in scope and economic impact. Some Canadians feel that the Trans-Canada pipeline might mean even more to Canada's overall development than the Seaway.

The pipeline is designed to deliver 780 MMcf/day with initial delivery by Nov. 1, 1958 (to the big eastern markets), of 300 MMcf/day. Current estimates are that the project will have an overall cost of about $378 million. However, this volume of 300 MMcf/day will be revised upward as the pipeline project develops and "blooms."

After the pipeline enters the "Saskatchewan Gate" on the Alberta-Saskatchewan border, a 586-mile 34-in. OD section takes it to east of Winnipeg. This is called the western section. A central section runs from the Winnipeg location eastward for 1251 miles to near Toronto. This section will be 30-in. OD pipe. Trans-Canada's eastern section has two extensions. The mainline is 308 miles of 20-in. OD eastward from near Toronto to Montreal. A connection of 33 miles of 24-in. will join the mainline near Toronto with Trans-Canada's Tennessee Gas Transmission connection at Niagara. This latter line has been in service for three years bringing natural gas from the U. S. to Toronto for market development.

In addition to the initial estimated cost of the Trans-Canada pipeline—$378 million—producers plan investing between $150-$200 million to develop natural gas properties. This is a direct result of the Trans-Canada project.

Distributors will talk about plans to invest over $200 million in Canada's natural gas future. These moneys will be plowed into new and enlarged distribution systems and facilities to move gas from the mainline to over one-third of the population of Canada—the customers who will immediately use natural gas for domestic, commercial, and industrial applications.

The liquefied petroleum gas and petro-chemical industries will be active when gas starts flowing through the Trans-Canada line. These strong offshoots of the natural gas industry will invest $100 million in stripping, dehydration and sulfur-removing plants. The gathering system—Alberta Trunk Line—will cost another $50 million. And, it is known that about $200 million will be invested in plants for industries using the new natural gas supply for raw material and plant feedstock.

It is easy to see that the Trans-Canada pipeline will trigger investments in Canada's future that now add up to over *$1 billion* between now and 1961. But business experts in Canada say this is pretty conservative. *Estimates* indicate the putting-together of Trans-Canada's dynamic project will mean investments in Canada of over *$2 billion* in the next five years directly attributable to natural gas being brought to energy-hungry markets.

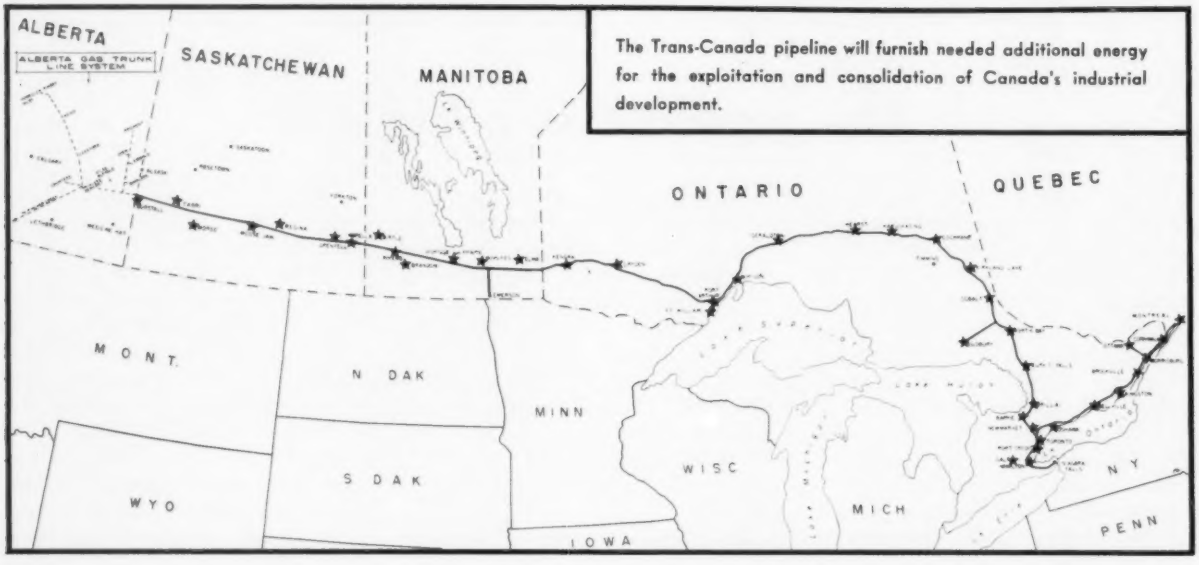
One wonders where all the Canadian regulatory, financial and political oppostion came from.

Events and chance shape a nation. Radisson and des Groseilliers opened the way in Canada for the Company of Gentlemen Adventurers Trading into Hudson Bay—the Hudson's Bay Company whose name has been synonymous with Canada's development for 300 years. Thus, white man reached the bay where Henry Hudson, inspired and uncompromising, was cast adrift to meet his fate on the bleak cold waters that bear his monument.

And Alexander MacKenzie battered his way with the fortitude of the Scotch down his long River of Disappointment to the Arctic. Franklin suffered for Canada, as did his followers. Then, railroad engineers threw their engineering handbooks away and licked nature and terrain to build the steel rails of the Canadian Pacific railway to the west. The Canadian National joined CPR to form the backbone of Canada's transportation system.

Now, the Trans-Canada pipeline will furnish needed additional energy for the exploitation and consolidation of Canada's industrial development. It is an event of no less importance than any of those mentioned, and may well shadow most.

The Trans-Canada pipeline ushers in a new industrial era to mighty Canada. It, along with the Westcoast Transmission Co. Ltd's pipeline in the west, is opening a new frontier—the Canadian natural gas frontier.



The Trans-Canada pipeline will furnish needed additional energy for the exploitation and consolidation of Canada's industrial development.

Major markets for the Trans-Canada project

CANADA is growing and will continue to grow. This growth is reflected in statistics treating the years past and forecasting the years to come. Canada's population, industrial structure, gross national product, standard of living and general economy are all making rapid gains. Energy is required for these growths and an adjustment of energy sources is expected just as energy sources have adjusted themselves in the United States to changing conditions brought about by growth.

The Gordon Report (Preliminary Report, Royal Commission on Canada's Economic Prospects) in its conclusion states: "In this preliminary report we have forecast a very considerable economic expansion for Canada in the next 25 years. . . . If a global war is avoided, and if other assumptions we have made are substantiated by events, we expect that over the period the total output of the economy will about triple. This should bring about a remarkable increase in living standards and in the levels of per capita net disposable income."

Couple these statements with the population growth expected in Canada. The population in 1955 was 15,575,000. Predictions of the population by 1980 are related to several assumptions for net immigration levels:

If net immigration per year is	Estimated population in 1980
50,000	25,770,000
75,000	26,650,000
100,000	27,535,000

Canada's per capita energy consumption approximately equals that of the United States. Her population, however, is relatively small. But the majority of this population is compressed into the strip of Canada that roughly parallels the U.S.-Canadian border. And the route of the Trans-Canada pipeline slices through the heart of this "populated belt" as it traverses Canada. Too, approximately 80 per cent of the potential markets east of Alberta are located in central or eastern Canada.

The potential market for Trans-Canada's natural gas in the United States should not be discounted. Subject to certification by the Federal Power Commission, arrangements have been made to sell substantial volumes of gas to Midwestern Gas Transmission (subsidiary of Tennessee Gas Transmission Co., Houston) at Emerson, Manitoba on the International Boundary. These plans have little or no bearing on Trans-Canada's markets until such time as FPC grants approval of the import to Midwestern and certifies Midwestern to build the facilities required to take the Canadian gas to proposed markets in midwestern U. S.

However, regardless of the outcome of the FPC hearings currently underway on the Midwestern project, Canadian natural gas from the Trans-Canada pipeline will undoubtedly be brought across the International Boundary sooner or later and sold for resale to one or more U. S. transmission companies. This U. S. market is certainly advantageous and attractive to Trans-Canada; however, it has been shown that the Trans-Canada project can stand on the merits of its Canadian markets alone.

When studying a pipeline com-

pany's markets, the question arises as to which comes first, the pipeline or the market. Signing firm contracts for gas when there is no pipeline to deliver the commodity is difficult. Pricing varies as to the cost of gas, distance of transmission, load factor, volume of gas and number of important utility customers along the line—among other things.

It has been the experience of recent, new pipeline projects built in the United States that once the pipeline is well underway, potential or "hang-back" customers soon start lining up for gas supply. It boils down to the potential customers (utility and direct sales types) saying: "Show us you can finance and build this pipeline, then we will sign up with you." Of course, a certain foundation of market must be signed up before a pipeline project can be financed. So, which does come first, the pipeline or the market?

Trans-Canada had these troubles and licked them by signing up enough market to make the project economically feasible. Now that the pipeline is well under construction, the market will rapidly develop and utility customers who held off initially will be saying: "Be sure to save us X volume of gas."

The breakthrough point in Trans-Canada's development came when it had signed contracts for the supply of gas in enough quantity to satisfy the demands of the signed contracts for the sale of gas to distribution customers.

One might say there was no market in Canada that was depending upon natural gas for only 2 per cent of its total energy requirements in 1926, and just 4 per cent in 1953. But, natural gas was available in required volumes only in western Canada from proven fields that were 1800 to 2500 miles away from the major markets of central and eastern Canada.

Develop a plan to build a pipeline to connect prolific natural gas reserves with adequate markets, and back up this plan with signed contracts for gas supply and gas sale, and you have a project that can be financed.

In simple terms, this is the story of Trans-Canada. To back this up, the Gordon Report estimates that by 1980 natural gas will supply 25 per cent of a greatly increased total of energy used. And, further, "The projected demand for natural gas suggests in fact that its consumption may increase 10 or more times with the 25-year period."

A look at specific markets

In swinging down the Trans-Canada pipeline from east to west, the first major market is Montreal, Quebec and vicinity. Greater Montreal has had gas service for a long time—since 1837. But manufactured gas plant capacity and the distribution systems have not kept pace with the growth of the area. The recently formed Quebec Natural Gas Corp. is busy rectifying this situation. (See "Montreal Can Be Canada's Biggest Gas-Consuming Area," GAS, June 1957, p. 67.)

Quebec Natural acquired the manufactured gas properties and distribution system of Quebec Hydroelectric Commission. The new company was organized solely to operate as a natural gas distribution company in the Montreal area.

Service area of this company includes a population of over 1,611,000 people. A program of appliance conversion for 240,000 existing customers is under way. System expansion and improvement will start in earnest in 1959 and extend over the following five years. The expansion will cost $30 million.

Commonwealth Services Inc., New York, has been retained as consultants in the development of Quebec Natural and its construction operations. Basic market studies and reports, and feasibility studies and reports, were also made by Commonwealth.

The area is currently being served with manufactured gas on a temporary basis. But a Toronto-to-Montreal link of the Trans-Canada pipeline is under construction. It is scheduled for completion by Nov. 1, 1957. Trans-Canada Pipelines plans to purchase natural gas from Tennessee Gas Transmission's system near Niagara Falls and deliver it to Montreal until the western and central sections of the Trans-Canada project (also under heavy construction) are tied-in with the eastern (Toronto-Montreal) section. Then, gas supply will be entirely from natural gas reserves in western Canada.

Gas supply contract between

Odorizer house at town border station of Consumers' Gas Co. of Toronto. Natural gas—delivered by TGT system from the U. S.—is flowing through this station at this time.

Trans-Canada Pipe Lines and Quebec Natural Gas was signed Feb. 6, 1957. Initial deliveries covered are for 14.5 billion cu ft of natural gas in 1958. Quebec Natural's demand is expected to grow to 41.5 billion cu ft during 1962.

The expandability of the Greater Montreal market is based on population growth at a rate of 50,000 per year; single-family house construction at a rate of 10,000 units per year; shift of living habits from multi-family units to suburban homes; and, the source of it all, heavy industrial expansion.

All of the requirements for continued industrial expansion are present in the Montreal vicinity. It is located on the crossroads of inland and ocean navigation. Labor supply seems adequate for years to come. In addition to Canadian and United States investment capital, British, French, Belgian, Dutch, and German interests are active. The introduction of a new, convenient, economic, abundant energy source—natural gas—will mean an additional stimulant to Montreal's industrial life.

Moving westward, a 40-mile stub from Morrisburg on the Trans-Canada pipeline will bring natural gas service to Ottawa. Interprovincial Utilities Ltd. now serves the Ottawa market with manufactured gas, but has come under the scope of Consumers' Gas, Toronto. Gas has been available there since 1856. The distribution system now serves Ottawa and some nearby towns with an aggregate population of about 162,000. Some 3000 gas customers are connected. Growth is expected in the Ottawa area. The system is being reinforced and expanded in preparation for the arrival of natural gas.

The next *major market* for natural gas is Toronto, although there are townships and villages between Montreal and Toronto that will provide markets. Toronto is the hub of the Canadian gas industry and is the center of trade, commerce, and industry in Ontario—Canada's most industrialized province.

Toronto is a big, sprawling, not-too-clean city that has increased its population by 20 per cent in the last five years. It follows that new industry—500 new industrial establishments in the last decade — is the foundation for this growth. The spiral of expansion is not over for Toronto.

Toronto's gas utility, The Consumers' Gas Company of Toronto, has carefully measured past growth, evaluated pace and direction of future growth, and is doing something about them. System construction, aggressive promotion, good customer service and competitive pricing policy, have been teamed to match the service area expansion. Consumers' Gas is one of the fastest—if not the fastest—growing gas companies in North America. And it continues to grow every day in the scramble for Ontario franchises.

The utility, and its subsidiaries, supply gas service to metropolitan Toronto and many suburban communities of its environs. Service area has a population of 1.8 million. Gas supply to Consumers' Gas is unique.

Manufactured gas service was started in Toronto in 1848. This gas fuel was distributed until 1954. In November of that year, natural gas from Louisiana and Texas was introduced to Consumers' Gas system. A subsidiary, Niagara Gas Transmission Ltd., purchases the Gulf Coast gas from producers. The Marine Gathering Co., Phillips Petroleum Co., and Kerr-McGee Oil Industries Inc. are the suppliers.

Niagara's natural gas is moved through the United States in the huge Tennessee Gas Transmission system. TGT makes delivery to Niagara Gas Transmission at the International Boundary (actually at a point under the Niagara River). Niagara Gas transports the natural gas from the Niagara River to its main point of sale at Sheridan, Ont. The carrier medium is a leased pipeline owned by Western Pipe Lines, a subsidiary of Trans-Canada Pipe Lines. Niagara Gas' lease covers operation of this pipeline for five years, ending Nov. 1, 1959, or when Trans-Canada brings Alberta gas to the area, whichever is earlier. If the Trans-Canada mainline system is not completed and supplying western Canadian natural gas to Consumers' gas by Nov. 1, 1959, Niagara has the option to purchase the Niagara River-to-Sheridan pipeline from Western.

Obviously, Trans-Canada will beat this deadline. Therefore, when western Canadian gas starts to flow to the Toronto area through the Trans-Canada pipeline, importation of U. S. gas will effectively cease and all of Consumers' Gas requirements will be met by the Trans-Canada pipeline.

Since the introduction of natural gas, Consumers' has been actively promoting the sale of the fuel and gas-burning appliances. It has also made voluntary rate reductions to increase the competitive price advantage of this modern fuel. One reduction was made in 1955. A second voluntary rate reduction was made in 1956. Both of these moves have contributed to substantial increases in yearly sendout for both years.

In other ways too Consumers' Gas has moved forward to meet the challenge of the market for gas in Toronto and vicinity. It acquired all the stock of Provincial Gas Co. Ltd., bringing 21,000 customers in the Niagara Peninsula area to Consumers' system. Another 1100 customers were picked up through acquisition of Ontario Shore Gas Co. Ltd., with service area in Oshawa, Whitby and Bowmanville (Ontario). And Consumers' Gas has secured 14 new franchised service areas for natural gas distribution operations.

Consumers' started a comprehensive three-year construction program in 1955. Prime purpose is to build a feeder main or grid main system that will provide mains close to all suburban areas where home building is active or expected. As an example, in 1956, which was the second year of this program, more than $4.3 million was spent for the construction of 28 miles of 12-in. mains, 10 miles

The Trans-Canada pipeline will serve about one-third of the Canadian population. Loader-backhoe speeds utility work to bring Canadian gas to domestic consumers.

Canadian distribution systems are, generally, being installed with corrosion prevention in mind. Here, distribution company brings up test-leads during initial construction.

Nearly completed district regulator station goes in for Consumers' Gas system in Aurora, Ont. Completed station will be painted and landscaped to produce pleasing appearance.

Coated and wrapped steel pipe is being used by a Canadian distribution company to bring natural gas into an area without gas service. The main is being solid-welded.

of 8-in. mains, 24 miles of 6-in. mains, and 29 miles of 4-in. mains.

This program is now in its third year of development. In addition to feeder main construction, the new franchise towns are being piped with completely new distribution systems; and new town border stations, district regulator stations, and gas control facilities are under way.

There can be no doubt about it, Consumers' Gas is out after the load. Its promotion, advertising and sales efforts reflect this. Its gas sendout volume increase tells the story. In 1955 the sales volume (natural gas) increased 1054 MMcf for the year—an increase of 29.4 per cent on an energy basis. Gas sales were up 74 per cent in 1956—from 4638 MMcf in '55 to 8062 MMcf in '56. But this is really only the beginning with a company like Consumers' Gas that has a market and progressive management. Rest assured that they are out right now lining up new franchises and loads.

The Union Gas Company of Canada Limited is another growing distribution system in Ontario. It blankets the southwestern section of the province. At the first of this year, Union had 95,000 customers. Its service area is growing as industrial activity is high and promises to continue at this level. Advantageous rates and increased availability of gas supply will mean more replacement of other fuels in industry.

With the overall natural gas picture for eastern Canada taking an entirely new shape as the Trans-Canada pipeline develops, Union Gas is into the early stages of the largest expansion program in its history. About $35 million will be used to expand its system in the immediate years. Production, storage, transmission and distribution facilities will be built or added. In the very preliminary stages of the program during 1956, more than $1.4 million was spent to expand the system. Of this, $816,000 was invested in additions and expansions of distribution systems; and more than $625,000 was used for additions to natural gas production, transmission, distribution and general plant items.

Union Gas is unique among Ontario distribution companies in that it has and buys Ontario-produced gas. In addition, it has manufactured gas plant. Hamilton, Ontario, headquarters city for the company, is still supplied with manufactured gas. Most of the other segments of the service area are on natural gas. Some of its service area is served by owned or controlled subsidiary companies.

Union has its own gas resources in 10 or so gas fields of Ontario. Large volumes of gas are purchased from independent producers with Ontario reserves. Consolidated West Petroleum Ltd. sells Union Gas production from wells located offshore in Lake Erie, for instance.

Two other features of the Union gas supply situation are natural gas imports from the U. S. and underground storage. The storage is unique and is the center of Union's operations. The storage field is an underground stratum near Dawn township, Lambton county. This is the chief dispatching center for the system. Hourly checks on pressure and flow conditions at the principal markets are maintained through radio communication.

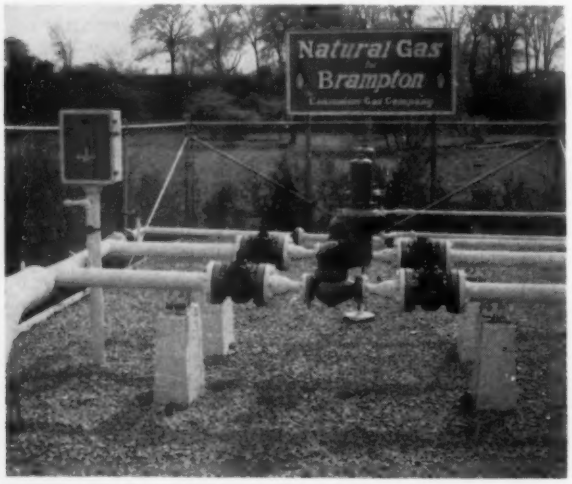
During the off-heating season months of 1955, for instance, 4.51 billion cu ft were pumped to storage, making a total of 11.39 billion cu ft available from in-place storage for the '55-56 heating months. But Union Gas is now expanding this facility as part of its objective to assure always-adequate gas supply to the customers in the 68 communities served. Pipe for a new transmission line from the Dawn storage property to near Hamilton is scheduled for late delivery during the current construction season. Plans have been drawn up to bring storage gas into the Hamilton area and this line will enable the Hamilton distribution system to convert from manufactured to natural gas. Other communities and companies will be allocated gas from this new pipeline. Completion this year depends upon construction time between delivery of pipe and freezeup, and availability of pipeline contractors. The cost of expanding the storage project and constructing the transmission lines to handle it are estimated between $13.3 and $14.75 million.

Union Gas' total sendout for the last fiscal year was 13.9 billion cu ft, with 8.5 billion being Ontario-produced fuel. Prime source of the difference is Panhandle Eastern Pipe Line Co., Kansas City. Their original agreement called for an annual delivery of 5.5 billion cu ft. Under a more recent (April 1954) agreement approved by the U. S. Federal Power Commission in late June 1956, additional volumes up to 15.5 billion cu ft a year can be exported from the U. S. by Panhandle Eastern for delivery to Union Gas.

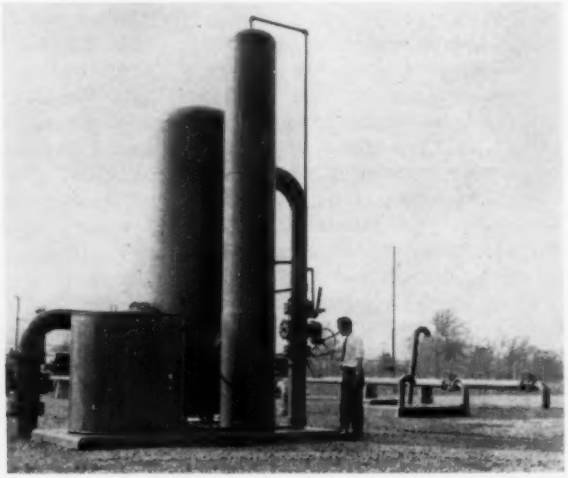
Trans-Canada Pipe Lines entered the Union Gas supply situation when a contract between the two companies was signed in January 1955. This agreement calls for western Canadian natural gas to be delivered to Union for a 20-year period. Delivery is scheduled to begin with an average of 45.2 MMcf/day on or before November 1, 1959. The contract specifies that the average daily delivery will hit a maximum of 175 MMcf in the 12th year and will continue at that peak for the remaining period.

When delivery from the Trans-Canada Pipeline starts, the April 1954 contract with Panhandle Eastern will cease. However, this does not disturb the prior contract with Panhandle for 5.5 billion cu ft per year of U. S. natural gas.

Union Gas' market has all the factors for rapid growth. The company is moving with this potential and it is safe to predict that its operations will more than triple in the next few years. Sales promotion is increasing the number



Master pressure regulating station recently installed by Consumers' Gas for Brampton, Ont. Consumers' will build a grid-main system throughout most of its service area.



U. S. natural gas flows into Consumers' Gas sprawling distribution system through these station inlet scrubbers. In 1958, Canadian natural gas will essentially replace this flow.

of connected customers in the service area and increasing the utilization of gas in the homes of connected customers. Union Gas sells appliances and conducts schools for training appliance dealers, plumbers and heating contractors in efficient, safe, modern appliance installation and utilization. A broad sweep of advertising media are used to tell the gas "story."

Lakeland Natural Gas Limited is a new distribution system that is putting together existing distribution properties and securing franchises in central Ontario. It now has 18 or 20 municipalities from Port Hope to Morrisburg lined up. Public financing is under way to secure $18 to $20 million for investment over a two-to-three-year period. It is hard at work at interesting additional municipal systems in its group. Lakeland has run head-on into Consumers' Gas with this endeavor. Natural gas will be taken from the Toronto-Montreal section of Trans-Canada's pipeline. However, it is possible that volumes available from this line during the 1957-58 heavy-load season will not permit connection and conversion for all of Lakeland's area immediately. So Lakeland Natural is looking toward 1958 as its big construction year.

The competition between Lakeland Natural and Consumers' Gas reached fever heat during this writing. It is hard to say which company will wind up with what franchises. Lakeland Natural seems to have the Cornwall market. However, another really choice market—Kingston—is touch and go. Together, these properties would yield a service area of 90,000 population with a very enticing industrial activity and potential.

Lakeland Natural has retained Commonwealth Services Inc. to design, engineer and supervise construction of its complete development.

Northern Ontario Natural Gas Company Limited is putting together the most interesting distribution system complex to be served by the Trans-Canada pipeline. Northern Ontario Natural is on the market with an $8 million debenture-common stock issue to finance initial construction in a project that will pipe over 34 municipalities in northern Ontario from the Ontario-Manitoba border to near Toronto. Some of these communities are situated on the Canadian Shield and will require hard-rock crews for trenching distribution systems. There are no gas distribution facilities (other than LPG) in the entire service area.

Every foot of pipe in the Northern Ontario Natural system will have to be built from scratch. Town studies and surveys also had to be started from the same point. There was little or no acceptance of natural gas for domestic, commercial, or industrial utilization until Northern Ontario Natural started its development.

Fish Service Corp. (Houston) is doing a "packaged" job for Northern Ontario Natural. This dynamic company made initial feasibility studies, market surveys, engineering evaluations, and system design. In addition, it has handled franchise and other legal or regulatory matters. Fish Service will supervise construction, inspect construction, and procure and train operating personnel. Also, Fish Service has arranged the financing and placement of the offerings. These functions are still active as Northern Ontario Natural is continuing to develop its system even after gaining franchises in some 34 communities.

Progress is being made in the construction of distribution systems for Kenora (gateway to the fabulous Lake-of-the-Woods country), Dryden, Fort Williams, and Port Arthur—all in the most western part of the service area, near the Manitoba - Ontario border. Trans-Canada will start deliveries to these systems Nov. 1, 1957.

Next year, systems from Nipigon to Orilla will be ready for natural gas due from Trans-Canada's pipeline in September 1958. Northern Ontario will build an 82-mile pipeline lateral between North Bay and Sudbury as well.

From personal travel over the Northern Ontario Natural territory, the general impression is of a thinly populated, heavily forested, lakeland section. However, the population of the towns that will be served with natural gas is 307,000 total, and there is more industry than immediately meets the eye. For instance, there are 11 major pulp-and-paper operations within economic distance of the systems and over 85 per cent of the free-world nickel supply is produced in the Sudbury basin. Other mineral properties are active. Two major iron ore strikes have been made. And the basic pulp-paper industry has doubled capacity since just 1954.

Domestically, there is every potential for a good heating load as the degree days average 11,000 to 12,000 DDD in some of the territory. This will be balanced with firm industrial and interruptible industrial gas to produce a load

Small-diameter pipe for a new Canadian distribution system being electric-welded. Distribution companies' rush for distribution system expansion matches Trans-Canada transmission system construction pace.

factor of 95 per cent within Northern Ontario Natural's properties.

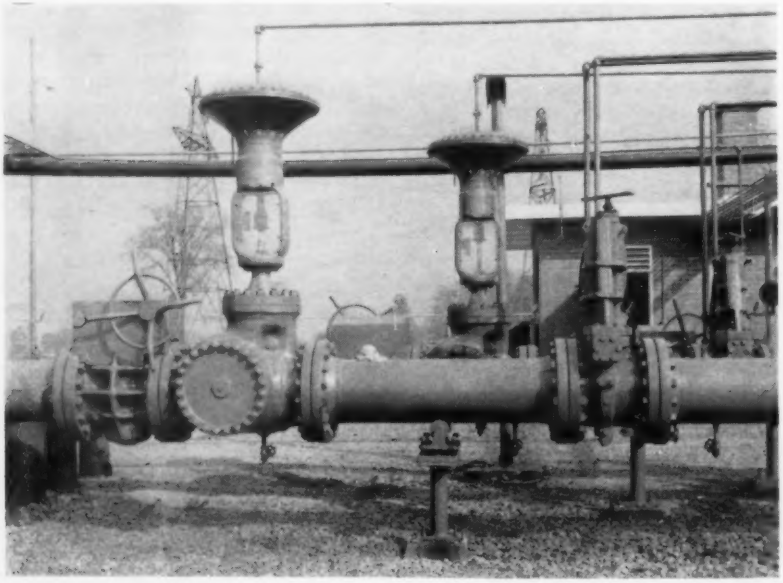
As mentioned, some of the towns are on solid rock, but others will not offer any unusual construction difficulties. The system will be operated at high efficiency because the distribution properties will be designed for new, specific conditions.

At present, fuel and light heating oils are moved into the area to market at about 25 cents/gal., on the average. Coal is more economical. But acceptance of natural gas is high since Trans-Canada plans are concrete and construction is rolling. Northern Ontario Natural is looking forward to connecting about seven out of 10 possible customers in communities it will serve. The company is shooting at an unusually high saturation of space heating. Most immediate fuel displacement will involve oil service. Future replacement of coal on a substantial scale is expected.

The communities to be served are populated by thrifty, industrious people. Couple them with the abundant natural resources and there is the potential for basic future growth. The industries that will be served by Northern Ontario Natural have made heavy capital investment and stem from established, stable concerns.

About $32 million will be required to construct the overall Northern Ontario Natural system. It will be a far-flung operation. Over 1100 miles separate the most eastern franchise from that for the west. The most western franchises—between Geraldton and Kenora—will be operated by Western Ontario Natural Gas Limited, a subsidiary of Northern Ontario Natural.

Moving into the Province of Manitoba, the Winnipeg area presents a firm, growing market. This is the entry city to the great central plains-and-prairie of Canada. The grain and breadbasket of the nation lies to the west. Winnipeg is a major city of 409,000 population, including satellite communities of the environs. The distribution company serving this market is Winnipeg & Central Gas Company. This distribution company grew out of a provincial electric and gas operation in 1953. Winnipeg & Central has continued manufactured gas operations, but looking to the future has resulted in expansion. Several housing developments relatively remote from the existing distribution mains have been put on propane gas service operation or piped and served with propane-air. These will, of course, be integrated with the prime system on the arrival of natural gas from western Canada via Trans-Canada pipeline.



Measurement and pressure control equipment at a large natural gas distribution company's town border station in Canada.

Winnipeg & Central has embarked on a $20 million expansion program. The primary facilities of this program will be in shape to take deliveries from Trans-Canada by Sept. 1, 1957. Expansion will proceed on a planned basis for the next three years.

The southern portion of Manitoba, with Winnipeg as its anchor, supports about 90 per cent of the province's population. Half of these people are engaged in grain-growing, cattle-raising, and dairying. Winnipeg contains fully half of the province's population taken on a Greater Winnipeg basis.

Metropolitan Winnipeg has some diversified manufacturing of small and medium-sized products. But most of the people are involved in meat and other food product, clothing and petroleum industries. Large railroad shops and maintenance facilities are in Winnipeg. The city is the railroad center of western Canada.

The domestic natural gas load should prove-up well. The commercial market will also show marked development upon the arrival of adequate natural gas supplies. Industrial gas utilization will not prove spectacular in the area.

Winnipeg & Central has signed a contract with Trans-Canada Pipe Lines for natural gas at an advantageous rate specifically designed to aid the distributor—not now operating with natural gas—in developing its markets. This development rate will be available to Winnipeg & Central from turn-on date for the first three contract years.

Under this rate and stepped-up promotion and sales effort, Winnipeg & Central will grow. Surveys indicate its average maximum day sendout will increase by 50 per cent during the first five years of natural gas operation.

The only other markets of any consequence in Manitoba will be at Portage la Prairie and Brandon. Portage will be served by Inter City Natural Gas and Brandon by Plains Western Natural Gas. They are communities serving as subcenters for agriculture in their vicinities. Domestic loads will develop along with light commercial loads. Industry will supply a com-

paratively light load in these cities.

The Province of Saskatchewan offers market for natural gas from the Trans-Canada pipeline in Moosomin, Indian Head, Regina, Moose Jaw, and Swift Current, among others. Moosomin is, like most of the prairie stations, characterized by towering grain elevators rising above the Kansas-like flatlands. Indian Head has a population of about 1500. There is some industrial production of bricks at this colorfully named town; milling is relatively active.

To the west of Regina, as the great plains are traversed, is Moose Jaw. This city of 26,000 people is Saskatchewan's third largest. It is the site of relatively well developed industrial effort. Milling, cold storage, oil refining, bags, blankets, rubber products and numerous small items are produced.

Swift Current with a population of 8000 has trees and parks that contrast it severely with the arid prairie hills that surround it. Grain, creamery products, tanning and casting are the principal industry—best described as light.

Saskatchewan Power Corporation distributes gas to virtually all municipalities of economic size in the province. Sendout gas is natural produced in nearby fields. A cluster of small fields around the Success play furnish natural gas to Swift Current and over as far east as Moose Jaw—the latter being tied in to a new 12-in. pipeline owned and operated by Saskatchewan Power. This makes up Saskatchewan Power's southern system. It is assumed that the Success-Moose Jaw pipeline will be extended eastward to Regina if the fields prove-out with sufficient gas reserves. However, the Success field is declining and investigation is being made into the feasibility of converting it to underground storage.

The Saskatchewan Power northern system takes gas from Coleville and Brock fields to supply numerous small communities and Saskatoon and Prince Albert. Gas supply is adequate for the system and a compressor station is under construction at the point where a 10-in. pipeline links the Coleville-Saskatoon 14-in. pipeline with the Brock-Saskatoon 10 incher.

Key to Saskatchewan Power's expansion is the capital city of Saskatchewan, Regina. This major city of the province has a population of 90,000-100,000 people and has not been served with gas. Regina is now being piped with a completely new natural gas distribution system.

Fish Service Corp. has been retained by Saskatchewan Power as overall consultant in the development of the latter's provincial gas system. Fish Service has done the market and feasibility surveys, system design, and supervision of construction. The new compressor station was designed by Fish Service and will be built under its supervision.

The distribution system for Regina will involve about 150 miles of gas mains and another 150 miles of service lines. A town border station has been constructed near a tap on the Trans-Canada pipeline. Required district regulator stations are completed or under construction.

Full-scale natural gas operations in Regina are planned for 1958. Limited operation will begin for the 1957-58 heating season. Saskatchewan Power expects to have about 80 per cent saturation in five years. This prediction is well founded by Fish Service Corp.'s studies and by previous experience in the introduction of natural gas to Swift Current and Moose Jaw. Saturation of gas customers was reached in the latter two cities after only one-third of the advertising-promotion budget has been spent.

In looking for additional gas reserves, Saskatchewan Power has proposed plans for taking more gas from fields in western Saskatchewan as well as going across the Alberta-Saskatchewan border to fields in eastern Alberta. There has been some political opposition in Alberta relative to an interprovincial export to Saskatchewan.

Sidewalk engineers "lend a hand" as still more distribution piping goes into Canadian soil. Line will soon be delivering Alberta gas to eastern Canada.

With the Trans-Canada pipeline cutting through the southern part of its natural gas system, Saskatchewan Power has arranged for gas supply from the new, big pipeline. This will give the system combined sources of natural gas reserves. Present plans call for taking high load-factor gas from Trans-Canada. Probably most of the Regina distribution system requirements will come from Trans-Canada.

Trans-Canada currently plans to deliver 5 billion cu ft to Saskatchewan Power during the year Nov. 1, 1957 to Nov. 1, 1958. This will be decreased to 3 billion a year for the remaining 19 years of the contract, because Saskatchewan Power expects its own reserves to be developed sufficiently to supply the market.

Trans-Canada's money matters

FINANCIAL

A DOLLAR is a dollar until you get up in Canada. Then you learn there are Canadian dollars as well as U. S. dollars. And the Canadian dollar is worth more than the U. S. buck. Just how much more, we never were able to establish. It is our opinion that the rate must change every 30 minutes, based on the world money market or some equally confusing factor. So, we just cashed expense account checks —at a rate approaching one every 30 minutes—and got a slightly different amount, dollar for dollar, each time.

This adds nothing to the story of Trans-Canada's financial odyssey. It does well illustrate the fact that financial arrangements, even in a very basic form, are complicated. Trans-Canada's financial arrangements are no less simple.

Trans-Canada's financial road to the money markets was a long one. Certain of its officials will probably admit it was a longer road than the construction spreads will travel in making a pipeline to bring Alberta natural gas to utility markets.

The financial program for Trans-Canada Pipe Lines was announced on Feb. 14, 1957. Common stock debenture units were placed on the public markets the next day. Canadian and U. S. buyers went wild. The offering was completely oversubscribed. (We couldn't get any of their units either.)

The units went on the market in two forms, i.e., Canadian units and United States units. The Canadian units were composed of a $100 principal amount, 5.85 per cent, subordinated Canadian debenture and five common shares. United States units had a $100 principal amount, 5.60 per cent subordinated, United States debenture and five common shares.

The debentures in both classes are due 1987. The common shares of the units are in a Depository. Three common shares will be mailed to each unit holder of record on June 6, 1957. And the other two common shares will be transferred to holders of units on record between Nov. 1, 1958, and Dec. 31, 1959. In all, about $112 million was realized from sale of the units.

The approximate price of the units was $150 (Canadian) for the Canadian units and $155 (U. S.) for the United States units. There were plenty of takers. The units must be sold as such until Dec. 31, 1959, unless an early date is fixed.

Table 1 shows the types of securities issued. *Table 2* shows proceeds received by Trans-Canada.

First mortgage Pipe Line Bonds were taken to the tune of $94 million by some 50 institutional-type investors. Canadian agencies were well represented in this list.

Trans-Canada sponsors took another $10 million-worth of the bonds. A bank credit agreement for $20 million (from the First City Bank of New York, Mellon National Bank & Trust Co., and J. P. Morgan & Co.) was secured with a like value of first mortgage bonds.

Another $15.5 million was raised from sale of common stock to sponsors. The fact that the sponsors of Trans-Canada have purchased about $10 million out of a rough total of $124 million first mortgage bonds, and took on some $15.5 million in common shares, indicates

TABLE 1. TYPES OF SECURITIES ISSUED

Title of Class	Authorized or to be authorized	Outstanding as of Dec. 31, 1956	Outstanding Upon Completion of Financing
First Mortgage Pipe Line Bonds			
5½% Series due 1978	—	None	$23,010,000
5¼% Series due 1978	—	None	$80,990,000 (U.S.)
5% First Mortgage Bonds due April 2, 1957	$80,000,000	$43,750,000	None
5¼% Bank loan due March 1, 1962	$20,000,000 (U.S.)	None	$20,000,000 (U.S.)
Subordinated debentures due 1987			
5.85% Canadian series	$54,166,700	None	$54,166,700
5.60% U.S. series	$20,833,300 (U.S.)	None	$20,833,300 (U.S.)
5½% subordinated convertible income notes due 1987	$21,000,000	None	None
Preferred shares, $50 par value	1,000,000 shs.	None	None
Common shares, $1 par value	10,000,000 shs.	1,928,184 shs.	5,823,143 shs.

the unusual drive backers have made to get their financing off and rolling. Most of these original sponsors are also under obligation to cover any deficiency in interest on bonds and subordinate debentures, and depreciation deficiencies, up to 1963. This obligation is shared by three of the managing underwriters: Nesbitt, Thompson & Co. Ltd., Montreal; Wood, Gundy & Co. Ltd., Toronto; and Osler, Hammond & Nanton Ltd., Winnipeg.

These firms also have interests in common stock totaling 241,843 shares.

The other managing underwriters are: McLeod, Young, Weir & Co. Ltd., Toronto; Lehman Brothers, New York; Stone & Webster Securities Corp., New York; and White, Weld & Co., New York.

Investors in Canada were given the first opportunity to buy under the announced public offering. At least 46 per cent of the common shares were taken in Canada at the time of the offering. With the Canadian-held shares of common stock previously outstanding added to this percentage, there is little doubt that Canadians owned more than 51 per cent of the public offering when issued. This was in line with Trans-Canada Pipe Lines' policy relating to Canadian ownership.

The stock ownership by sponsors before and after financing is shown in *Table 3*. After the public financing was completed, the breakdown of ownership looked like this:

TABLE 2. PROCEEDS RECEIVED BY TRANS-CANADA

	United States Dollars	Canadian Dollars
Canadian Series Bonds	—	$ 23,010,000
United States Series Bonds	$ 80,990,000	—
Bank Loan	$ 20,000,000	—
Canadian Units	—	$ 78,000,048
United States Units	$ 31,249,950	—
Total	$132,239,950	$101,010,048

TABLE 3. STOCK OWNERSHIP BEFORE AND AFTER FINANCING

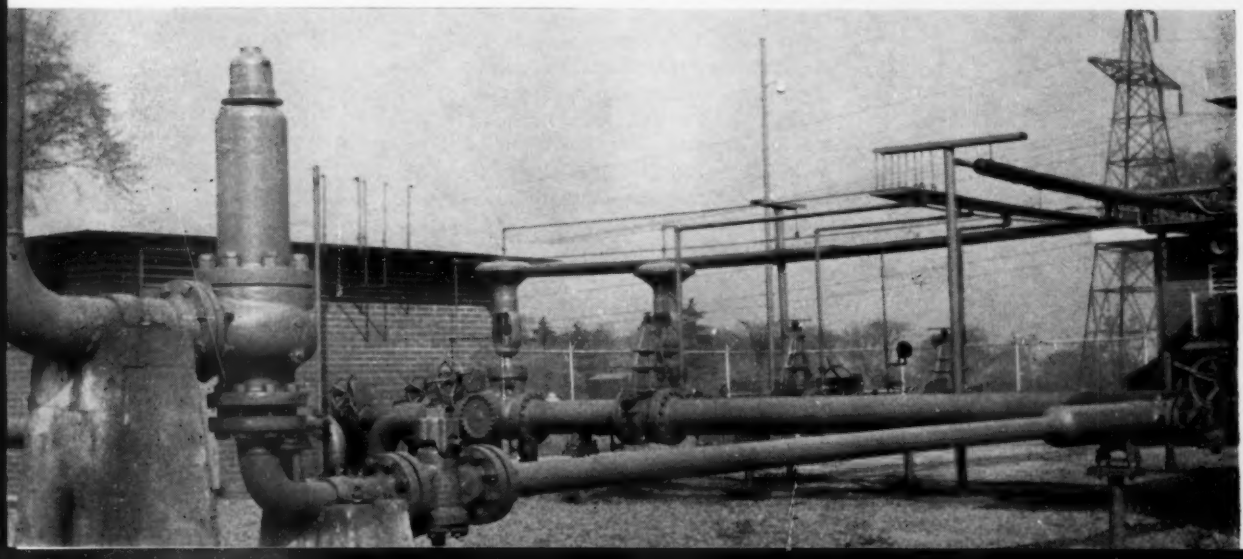
	Per cent before financing	Per cent after financing
Canadian Delhi Oil Ltd.	25.77	8.53
Hudson's Bay Oil & Gas Co. Ltd. (subsidiary of Continental Oil Co.)	17.0	5.63
British American Oil Co. Ltd. (subsidiary of Gulf Oil Corp.)	17.0	5.63
Tennessee Gas Transmission Co.	17.0	5.63
Other original shareholders	23.23	7.69
	100.00 per cent	33.11 per cent

Trans-Canada sponsors	33.11 per cent
Public in United States	17.89 " "
Public in Canada	46.51 " "
Issued upon option to attract and hold key executive personnel, and for employee participation	2.49 " "
5,823,184 common shares	100.00 per cent

The breakdown of the public offering—apportioning units to financial houses in the United States and Canada—is controlled by the managing underwriters. It has been shown that three of the Canadian underwriters assumed unusual obligations—and took greater risks. Properly then, they urged that more common shares be made available to Canadian buyers. This was done.

The underwriters now have no further control over where the shares (units) wind up. The units have been traded briskly on both sides of the border. Possibly, the Canadian trading is setting the pace. The shares—in unit form—are now free to move where buyers please. Impatient and short-term investors might sell rather easily. There are investors ready to snap up available units. So, financial circles will be watching the ownership fluctuations with interest over the next few years.

The equipment end of "men, equipment, time and money" required by Canadian distribution company to build systems to service growing markets with western Canadian natural gas.



FORMULATORS

Trans-Canada's problem solvers

N. E. TANNER

CHARLES S. COATES

IT takes men of vision and courage to build any pipeline these days. The financial, regulatory, and political aspects alone are enough to scare off most men—even the normally intrepid sort. Trans-Canada required men with unusual dedication, vision, and business horse-sense. They must have had unusually fine teamwork among their key officials to solve continuously snowballing problems.

Most important, they had to believe in the vital part the Trans-Canada pipeline will play in Canada's future. Further, they had to believe in the North American natural gas industry—and in themselves.

The principal executive officers of the company are:

N. E. Tanner, chairman of the board; Charles S. Coates, president; A. P. Craig, vice president; N. John McNeill, Q.C., vice president and secretary; and Robert C. Berry, C.A., vice president and treasurer.

The board of directors that has so ably charted the course of the company includes:

N. E. Tanner, Calgary, Alberta; Charles S. Coates, Toronto, Ont.; H. R. Milner, Edmonton, Alta.; Frank A. Schultz, Dallas, Texas; Hon. Edouard Asselin, Q.C., Montreal, Que.; T. H. Atkinson, Montreal, Que.; E. W. Bickle, Toronto, Ont.; R. C. Brown, Calgary, Alta.; John R. Fell, Long Island, N. Y.; E. D. Loughney, Toronto, Ont.; M. A. MacPherson, Q.C., Regina, Sask.; J. K. McCausland, Toronto, Ont.; C. W. Murchison, Dallas, Texas; A. Deane Nesbitt, Montreal, Que.; G. P. Osler, Winnipeg, Man.; Jules R. Timmins, Westmount, Que.; J. Ross Tolmie, Q.C., Ottawa, Ont., and O. A. Ward.

* * * * *

N. E. TANNER

Trans-Canada Pipe Lines' Chairman of the Board Nathan Eldon Tanner is best characterized as a man who is not afraid of work. His

career has been marked by varied hard work beginning with his boyhood days on a farm near Cardston, Alberta. Born in Salt Lake City, Utah, he came to Canada as a child.

Successively, he was a school teacher, general store operator, postmaster, school principal, a suit and insurance salesman (on the side), and town councilman.

He leapfrogged from local to provincial politics in Alberta and was elected under the Social Credit party. He became speaker of the house in the first session of the new government. He soon became Alberta's minister of mines and minerals and later took on the post of minister of lands and forests as well.

After the famous Leduc oil strike in February 1947, he was closely associated with the development of oil and petroleum resources of the province. His administration is remembered for its fair and just regulation under which Alberta's oil and gas business has more than prospered.

Mr. Tanner resigned his government ministerships to become president of the recently formed (in 1952) Merrill Petroleums Ltd. Mr. Tanner made this move in 1952.

Trans-Canada Pipe Lines requested he head this new company that had been formed by merger of the original Trans-Canada company and Western Pipe Lines. Mr. Tanner agreed to do this in March 1954, and he has led development of this company and its project that is destined to be an epic milestone in Canada's growth.

Eldon Tanner is unusually calm and reserved for a pipeliner. Perhaps this stems from his full religious life. He is stake president and guides Mormon church activities over a wide area of Alberta. He has a keen interest in Boy Scout work and his face portrays a fondness for the outdoor life—hunting, fishing, and camping. He has not had much time for these activities since joining Trans-Canada.

CHARLES S. COATES

Trans-Canada's newly elected president, Charles S. Coates, likes to take on a job that challenges and extends him. He found one with Trans-Canada Pipe Lines.

He has spent most of his adult life as a pipeliner and has met more than one construction deadline. But he never seems to be perturbed by a new deadline or construction problem. Perhaps the turmoil of building pipelines is now in his blood.

Mr. Coates looks like a pipeliner. He is a tall, rugged Texan with an engineering degree from the University of Texas, at Austin. Career development began when he gave up football and coaching to take a "position" as a roustabout in the Corpus Christi oilfields. Progress was right through the ranks to assistant superintendent of production. He joined the Chicago Corp. in 1942.

The Tennessee Gas Transmission Co. (Houston) was formed from a group that broke away from the Chicago Corp. Charlie Coates went with TGT as division pipeline superintendent. Tennessee Gas Transmission's system went a long way—about 7000 miles of pipeline—from its origin. Mr. Coates was a key figure in its growth and grew with it. He came up through the construction-engineering route and was elected a vice president of TGT on Jan. 1, 1948.

At 44, Mr. Coates is a young gas industry pioneer who is certain that Trans-Canada is vital to a Canada with a future. He is one of the select group in the industry known as pipeliners' pipeliners. His 6-ft 3-in. frame carries its 215 lb with authority, whether in an air conditioned office or out with the construction spreads on the right-of-way. He depends on team organization and team spirit. As is the case with most of those who are true pipeliners at heart, he takes a personal interest in his staff and their activities.

Trans-Canada has a long way to go yet. And they have some rough country and problems to lick. But Charlie Coates is confident his organization can do it. He has said it can be done and he means exactly what he says.

A. P. CRAIG

N. JOHN McNEILL

ROBERT C. BERRY

A. P. CRAIG

An able administrator and planner, A. P. Craig joined Trans-Canada Pipe Lines as vice president in mid-1954. He has furnished leadership in the signing of sales contracts. He will head the sales activities, as well as industrial and public relations, of the operating company. Mr. Craig is dedicated to Trans-Canada's objectives, particularly in relation to markets and the advantages natural gas service will present to Canada and the standard of living of Canadians.

The smooth, erudite Mr. Craig brings Trans-Canada years of business leadership from previous positions as vice president of Canadian Westinghouse Co. and director of shipbuilding for the Defense Production Dept. of the Government of Canada.

JOSEPH L. PARRISH JR.

N. JOHN McNEILL, Q. C.

The newly appointed vice president and secretary of Trans-Canada was born in McLeod, Alta. Mr. McNeill was admitted to the Bar of Alberta in 1937 and practised in Calgary. In 1953 he was made a Queen's Counsel and, in 1955, became resident partner in Calgary for the legal firm of Milner, Steer, Martland & McNeill. At this point he became active in public utility work, particularly in connection with Trans-Canada Pipe Lines.

CLINT MURCHISON

ROBERT C. BERRY, C. A.

Trans-Canada Vice President and Treasurer Berry was a senior resident partner of the Montreal-chartered accountancy firm of Deloitte, Plender, Haskins & Sells before joining the pipeline company as treasurer six months ago. Born and educated in Montreal, he received his chartered accountancy certificate in 1941, then enlisted in the RCAF and served as a navigator in India and Burma. He joined the Montreal accountancy firm in 1945, and was admitted to partnership in 1950. Mr. Berry is an active member of the public finance and taxation committee of the Canadian Chamber of Commerce, the Canadian Institute of Chartered Accountants, the Institute of Chartered Accountants of Quebec, and the Canadian Tax Foundation.

CLINT W. MURCHISON

Clint W. Murchison needs no introduction to oil and natural gas circles anywhere in the world. His industrial, financial, and other business activities reach into many fields—and he usually does well in each. He is a fabulous Texan who is actually more fabulous than most of them. Yet, he favors a plaid shirt, blue jeans and cowboy boots to a business suit. He is at home on his farm and ranch near Dallas, but is no stranger to Wall St.

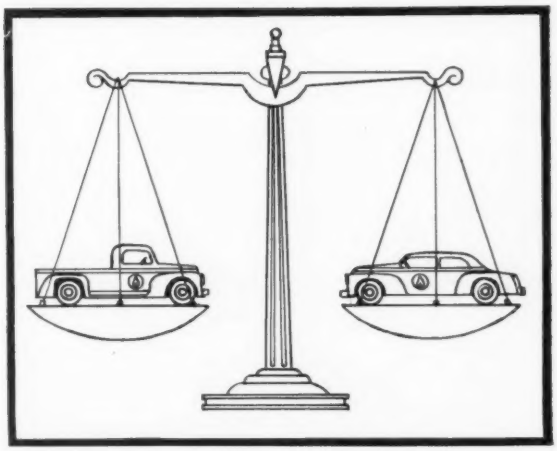
Mr. Murchison, represented by his Delhi companies, participates in many natural gas production and pipeline properties and operations. He was in on Trans-Canada Pipe Lines from the very origin and is one of the group who would never allow the project to die. He serves the company as a director.

JOSEPH L. PARRISH, JR.

Joseph L. Parrish Jr. is chief engineer. He is a taciturn conversationalist and is thoroughly seasoned in pipeline design, engineering, and construction. He previously was assistant chief engineer for Tennessee Gas Transmission Co.

For details on the history of the Trans-Canada project, where and how it will get its gas, the way it was designed and how it is being built, turn to the Pipeline Section, pages 113-140

Factors to consider in selecting customer service vehicles



By J. V. TURPISH, Atlanta (Ga.) Gas Light Co.
and
R. D. PRUITT, Citizens Gas & Coke Utility, Indianapolis

THE automotive fleet of the customer service department has only one function and that is to transport the utility's service facilities to the customer's premises. The more efficiently the fleet accomplishes this task, the easier it is to provide better customer satisfaction at lower cost.

This concept of the service department fleet puts it in the tool category and without any question it is the most expensive item of equipment in the service department. Does it not therefore follow that every effort should be exerted to obtain a maximum return from every fleet dollar invested?

Although basically all service departments operate alike, there are numerous variations in the details of these operations. Of course the variations depend on the company policy as set forth by management. This policy will sometimes provide a minimum of service and thus require very little equipment. At the opposite extreme is the policy which provides for maximum service and not only requires a thoroughly trained serviceman but also requires a variety of expensive tools and equipment to adjust and repair the modern complex gas appliances. Therefore, the service policy of the particular company must be considered when choosing the vehicle and body design.

In addition, such items as climate, type of roads and streets, character of territory—city, suburban or rural—must be considered in the final determination of the type of service vehicle.

Let us consider the two general types of vehicles in common use in most service departments, namely the business coupe and the one-half ton service body truck.

The business coupe (*Fig. 1*) is readily available. It is a standard automobile manufacturer's design,

Fig. 1. Typical business coupe used in gas company service work.

Service vehicles . . . New appliance tools result in added carrying weight

comes as a complete unit, and needs only racks, bins, radio, etc., to make it ready for operation.

Being a passenger car, its riding qualities are excellent. In city areas where arterial parkways are often restricted to use by passenger vehicles only, the business coupe can be driven on these limited-use streets when convenient.

Business coupes offer good side and rear visibility and therefore lead to safe operation. This is particularly important considering that coupes are almost invariably operated by a serviceman working without a helper to guide him while backing or entering a stream of traffic. The driving characteristics of the coupe more closely resemble those of the serviceman's personal car. This appears to be a decided safety factor particularly after the employee has acquired the habit of fast acceleration obtainable in his own car. Consequently the slower trucks have contributed to some accidents.

The coupe is quite satisfactory when used on specialized urban routes which do not require the car to be equipped with a large amount of tools and material. For this type of use, versatility of interior arrangement is not important so the fact that the business coupe is rather limited as to load placement is not a disadvantage. Heavy or bulky objects, such as meters, can be carried in the trunk where they are easily accessible (*Fig. 2*) while small items can be carried in the less convenient location behind the seat. With proper thought as to layout, the business coupe used on a specialized route can be arranged for maximum working ease for the serviceman. This pays off in servicemen's acceptance of the car, which logically results in increased job production.

The current purchase price of a business coupe is about $1725 to $1750. If the turn-in value is assumed to be 10 per cent of the purchase price, the depreciation amounts to $1550 or $1575. If the vehicle is replaced on a five-year basis then yearly depreciation amounts to $310 to $315.

The one-half ton chassis and service body combination usually excels the business coupe from the service department viewpoint.

The cab and chassis are in standard production and readily available. Service bodies of various types are in such widespread use today that they, too, can be had for relatively early delivery. Several service body manufacturers have basic body designs which in themselves are quite satisfactory and which, if the purchaser desires, can be modified somewhat to fit individual company requirements.

However, as previously stated, due to wide diversity in details of service policies it is impossible to design a single body that will meet the needs of all companies. The service body vehicle is more troublesome than the coupe to obtain and make ready to put in operation, but its advantages over the business coupe pay off for this trouble many times over.

The service body truck is, of course, basically a truck and therefore should not be expected to produce the same comfortable ride obtainable in a business coupe. However, since it is usually operated with a load somewhere near its rated capacity and usually used for short runs, this disadvantage is not important.

These vehicles offer side and rear visibility on a par with coupes, and consequently are not inherently hazardous on this score. Because of the ease with which equipment and material can be arranged in such locations as to eliminate straining and over-reaching by the man working from the car, they offer the advantage of additional protection against strained backs and pulled muscles. The cab of the service body truck is equipped with a full width seat as against the half or single seat characteristically used in business coupes. This provides safe and proper seating facilities for a helper, when one is used, as against the makeshift seat usually put in a coupe for such occasions.

As a further safety measure, all the more frequently used material and equipment can be placed so it is accessible from the rear or the curb side of the vehicle, leaving the street side compartments for less frequently used material and radio equipment.

When two-way radio is to be installed on service body vehicles a separate compartment can be provided. This makes it possible to service the radio without requiring access to other parts of the body. In coupes, radio equipment is usually mounted in the trunk, and when access to the radio is necessary it

Fig. 2. Trunk of coupe can be used to carry meters and other equipment.

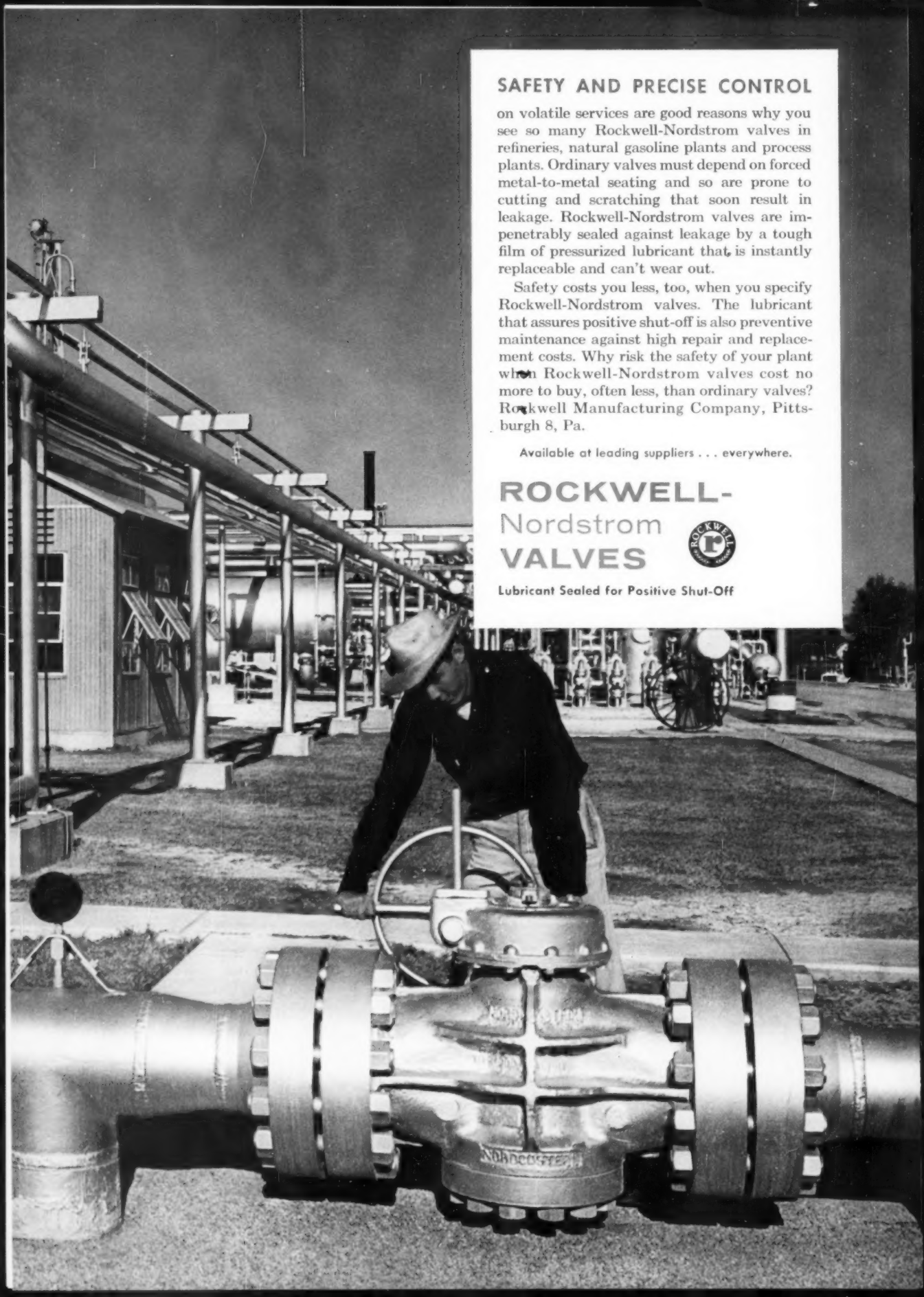
INSTANT, DEPENDABLE RESPONSE to push button or automatic flow control is assured when you specify Rockwell-Nordstrom valves. Their basic advantage for power operation that is lacking in ordinary valves: *lubrication*. Because the plug is seated on a film of pressurized lubricant, a "friction-free" surface keeps the valve ready for instant, smooth operation. And since the lubricant reduces torque and the plug is fully open or closed in a quarter-turn, a simpler, less costly actuator is needed.

Rockwell-Nordstrom valves are available in a complete range of sizes and pressure ratings with electric, pneumatic and cylinder operators. They cost no more to buy—often less—than ordinary valves. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Available at leading suppliers . . . everywhere.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed For Positive Shut-Off



SAFETY AND PRECISE CONTROL

on volatile services are good reasons why you see so many Rockwell-Nordstrom valves in refineries, natural gasoline plants and process plants. Ordinary valves must depend on forced metal-to-metal seating and so are prone to cutting and scratching that soon result in leakage. Rockwell-Nordstrom valves are impenetrably sealed against leakage by a tough film of pressurized lubricant that is instantly replaceable and can't wear out.

Safety costs you less, too, when you specify Rockwell-Nordstrom valves. The lubricant that assures positive shut-off is also preventive maintenance against high repair and replacement costs. Why risk the safety of your plant when Rockwell-Nordstrom valves cost no more to buy, often less, than ordinary valves? Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Available at leading suppliers . . . everywhere.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed for Positive Shut-Off

requires at least the partial unloading of the trunk. When coupes are left for radio service at a location not under the control of the company, they are often left parked unattended at the curb and a complete unloading of the car is necessary to prevent claims by servicemen of equipment being missing when the car is returned. Service body cars can be delivered for radio service with all compartments locked except the radio compartment.

The volume of carrying capacity of the service body vehicle is far greater than that of the coupe. This, of course, should be expected since body styling of passenger cars is intended to please the eye of the purchaser and induce accelerated trade in. Sometimes the result leaves considerable useless volume from the service department viewpoint. (About one quarter of the trunk is useless because of the rear axle channel.)

As time goes on, normal progress in gas appliances creates the necessity for carrying more and more specialized material and tools, each item resulting in added weight. Assuming equal loads near the design capacity of both the coupe and the one-half ton service body vehicle, the truck—because it is designed specifically as such—will give longer trouble-free service. Certain streets, such as parkways limited to use by passenger vehicles only, are not available to service body trucks. If such streets are of an arterial nature and inability to use them results in materially increased mileage in covering the route, this fact must be considered as a point in favor of the business coupe.

Let us here consider four of the more commonly used types of service bodies. *Fig. 3* represents one of the simplest. It is a standard pickup body equipped with floor mounted, covered boxes. The boxes, being of simple design, do not represent any great investment. The capacity of this type body is somewhat greater than the business coupe. The center of gravity of the truck when loaded is low and in cases where the facilities here depicted suffice, it is quite satisfactory.

The truck in *Fig. 4* is the same pickup truck; but with two extra

Fig. 3. Typical pickup truck used in gas company service work.

boxes mounted on and partially overhanging the sides of the body, it affords twice the carrying capacity. Note that all sections of this body are accessible without any need for the man to expose himself to passing traffic. Note also the tail board has been removed and a rear step and hand rail have been added.

Fig. 5 shows a type of service body designed as such in its entirety without the limitations imposed by having to integrate it into an existing pickup body.

Versatility of arrangement of material and equipment in this body and the ease with which the truck can be transferred from one type of service to another is probably its one outstanding advantage. The same truck can be used with equal advantage on an appliance service route and on a meter route for sets, removes, turn-ons and turn-offs. With a side-mounted vise and overhead pipe racks it can be used for appliance installation work where the appliance is delivered by another vehicle. By use of a separate set of drawers the same truck can be used for meter age changes

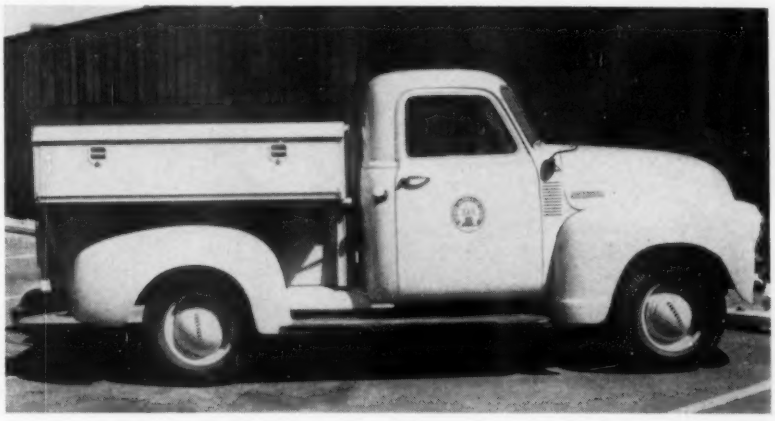


Fig. 4. Pickup truck with extra boxes mounted on body.

Service vehicles . . . Interiors should be designed for easy alterations

since it will hold the equivalent of 15 five-light meters. For suburban and rural use the efficiency of design of this vehicle has no superior since with a properly balanced inventory, it is truly what it should be—a mobile service department.

One other point worthy of mention concerning rural operation is the road clearance afforded by the truck. Where bad pavement or no pavement is encountered the service body truck will peform satisfactory where a coupe might sustain damage underneath. In cold climates where snow is a factor, the truck is superior to the coupe both for road clearance and for ease of installing and removing skid chains.

The interior of any service body should be so designed that it can be easily altered periodically as it is necessary to provide space to accommodate additional items of equipment such as millivoltmeters and flue gas analyzers.

The whole make-up of the service body vehicle is such as to appeal to the serviceman who drives it. He understands the thought which has gone into its design. He doesn't always agree with details or arrangement but knows refinements come with time. He is the man who uses the vehicle and management should consider his ideas. In fact he should be encouraged to offer suggestions for design improvements. If he has been consulted he will accept new designs.

In cases, such as in small properties, where servicemen take company vehicles home at night, the use of trucks instead of coupes is a good method of curtailing unauthorized personal use of company cars. Where an employee might find it convenient to use the coupe for personal purposes he would dislike to use the truck and instead would use his own car as he should.

No comparison of vehicle types would be complete without consideration of the public relations aspect involved. The customer wants prompt, complete service rendered in a pleasant manner. Complete service in a single stop is easier to render in a greater number of cases when the serviceman is supplied with adequate tools and equipment. As previously stated, except on specialized routes, this is not possible using a coupe. Rendering service in a pleasant manner, among other things, means the customer prefers to have the serviceman arrive in a modern, well maintained vehicle. This is just as easily accomplished with a service body truck as with a coupe.

Usually the quality of a man's work can be estimated by the way he maintains his tools and vehicle. A poor housekeeper will normally do poor work. However, the serviceman must be supplied with equipment that he can easily maintain in a clean and orderly manner. This is easier for him to accomplish when he is supplied with a proper vehicle. If an employee is proud of his equipment, then undoubtedly this pride will be reflected in his attitude toward the customer. No matter how good a mechanic a serviceman may be, if he does not make a good impression on the customer, his visit will not result in complete satisfaction.

The final point is that of cost. A one-half ton cab and chassis today costs about $1625. A first-class service body, properly equipped with a generous number of roller bearing drawers and with proper bins, shelves and partitions, costs about $950. Bodies of this type have been found from experience to have a life expectancy equal to two chassis. Using the cost of a chassis plus one-half the cost of a body, the total price is $2100. If we assume a life expectancy of eight years, as against five years for a coupe, a 10 per cent trade-in value for a chassis, and no value on the body after 16 years, we arrive at a depreciation figure per truck of $1940 or $240 per year as compared to approximately $315 for a coupe.

In conclusion it would be well to consider the probable, and hoped for, effect on service department operators of the new gas industry telecast. Here we are using the most modern method of communication to advertise the modernity of our product and appliances. How can we convince the public that this is true unless we keep in step with modernized servicing equipment and methods? ■

Fig. 5. Example of service body that has been specially designed for use by gas company.

This article has been adapted from a paper presented by the authors at the AGA Distribution and Motor Vehicle Conference, April 8-11, in Houston.

New concepts in

Management and organization

in the gas industry

The days of "opportunity profit" are rapidly passing from the gas industry, according to Mr. Allen. Citing the rapid growth in gas utility revenues from $1.2 billion in 1946 to $4 billion last year and an expected $5.2 billion in 1960, Mr. Allen says, "With such tremendous acceleration, profits have been good to excellent. Continued growth is almost a certainty, but maintenance of profit ratios is not."

Further growth is likely to be a costly process, he believes, listing higher prices for gas at the wellhead, increasing costs of new capital, and the slowness of regulatory bodies to respond to requests for rate increases as factors that will cut into profit margin.

By LOUIS A. ALLEN

Manager, Organization Planning, Booz, Allen & Hamilton, Chicago

IN the future we can anticipate that an increasing proportion of our net income must result from improved internal efficiency. Inevitably this points to the need for a critical examination of our methods and management and organization.

Already we can detect a significant ground swell. An increasing number of companies in the gas industry have been holding a magnifying glass to their administrative methods in an attempt to identify the critical factors which can be improved in the interests of reduced expenses, increased revenues and improved operating ratios.

In identifying the industry's needs in management and organization, it is important to note that gas companies are rapidly passing from the small company category. They are becoming larger, more dispersed, more varied in their activities, and they must face up to the fact that a large company cannot be efficient and profitable if it is managed and operated in the same fashion as a small one.

A company with annual revenues of $100 million is a different kind of enterprise from the one with $4 million or $5 million. The change is not altogether one of sheer multiplication. It lies in the character of the company itself.

As a company grows, it undergoes a subtle change. It begins to outgrow the people and the methods of operations that were instrumental in its early success. All too frequently, this change is unnoticed and suitable modifications are not made to accommodate it until a time of crisis is well upon it.

Every company starts small. Its early growth can usually be traced to the dominant influence of one or a very few individuals. One strong personality with drive, ambition, and an outstanding talent or idea invariably establishes for the company its first beachhead in the marketplace.

The company during this early stage operates under the personal leadership of this strong individual. He makes all the decisions of any importance, inspects work in progress, personally decides what changes and improvements are to be made and when. He tends to measure the success of the business in terms of the amount of money left over after the bills are paid.

This type of operation can be described as functional. One executive heads up all sales, another all operations, a third all purchasing. Authority is strongly centralized. The head of each function makes only the decisions having to do exclusively with his own function. The president makes all others.

This form of management and organization is best suited to the

needs of a small, growing company. It is direct, flexible, and economical. It enables the outstanding individual at the head of the company to transmit his genius to every decision, to every unit of product, and to every sale the company makes.

But sooner or later, every company outgrows this type of management and organization.

One human being cannot indefinitely continue to make all the complex and difficult decisions for the growing and diversifying enterprise. The functional organization becomes many-layered, cumbersome, inflexible and inefficient. Conformity, rather than initiative, becomes the pattern for success.

The crisis frequently occurs with the death or retirement of the strong leader. Or it may show itself in the loss of competitive position, decline in sales, failure to maintain leadership in engineering, operations, distribution, purchasing or other critical areas of the company's business.

A common danger signal that the company has outgrown personal, centralized leadership is the proliferation of various types of assistants, committees and coordinators at the top level. The chief executive becomes so immersed in the day-to-day problems and routine of operating the business that he no longer plans ahead and anticipates the problems and predicaments of the future because he has committed his entire strength and energy to the present. This is when continuity and profitability are most seriously threatened.

When the company becomes too large for highly centralized leadership, management leadership must take its place. Planning and coordination must replace individual genius, and an effective control system must replace "common-pot accounting" and personal inspection. People must be developed who are capable of making decisions and carrying things through to a logical conclusion without constant supervisory attention.

Need for these changes often is recognized only at the height of a crisis. A revolutionary upheaval occurs in the company. Sweeping reforms are initiated. New methods are introduced. Many new managers are hired. People are torn from their long-established social groupings. New kinds of specialists are introduced. Frequently ill-advised discharges and demotions take place. The net result is fear, insecurity, discontent and diminished efficiency.

Since it usually takes from three to eight years to accomplish such a changeover successfully, the accumulated disruption can be disastrous.

The better approach is to anticipate the need for change before the crisis occurs and to prepare for painless transition from one kind of management and organization to another.

The basic steps in the changeover are: Development of professional management concepts, improved delegation, decentralization, management development, and management incentives.

Company executives must learn to plan, to develop objectives, policies, programs and budgets. The first requisite of management planning is the development of clear-cut goals as to marketing, products, finances, people and other aspects of business. Policy development calls for management to anticipate repetitive problems and make standard decisions to guide the actions of all who are called upon to handle such problems. Programs should be developed to specify the sequence of work that is to be performed to reach the objectives of the company as a whole and for each department and unit. Programs should be specific and detailed, and whenever possible, should be accompanied by carefully designed schedules.

The executive who has not clearly defined the work he expects his people to do cannot delegate effectively. Every manager must perform the work of initiating and making the final decision with respect to planning and organizing, coordinating and controlling the work of those who report to him. He can delegate all routine, detail, and repetitive work.

Decentralization is the consistent and systematic delegation of authority to the operating levels of the company. Instead of the chief executive making the majority of decisions, as many as possible are pushed down to the lower operating levels. This not only takes much of the load from top management; it also enables line managers to make prompt decisions and to operate most effectively and economically.

Decentralization tends to be an empty phrase unless it is accompanied by divisionalization and an effective control system. Divisionalization is the process of splitting the company into relatively self-sufficient units which can be held accountable for profit and loss. Effective controls are required so management can check up on how well the decentralized work is being performed. This involves the development of performance standards and an effective recording and reporting system.

One of the most critical shortages in the gas industry, as is true in business as a whole, is the shortage of qualified managers. Every company that plans to grow and decentralize must at the same time plan for the development of the kind of broad-gauge capable managers who can implement this growth and decentralization. This is not merely sending people off to short courses at colleges and universities. An appraisal system must be set up to determine the strengths and weaknesses of potential managers within the organization. On-the-job counseling should be used to teach them to plan, organize, motivate, coordinate and control the work of others. Finally, an environment must be created within the company to encourage the maximum development of these managerial skills.

Managers will be most productive in a divisionalized, decentralized and soundly managed organization only if a *plus* is built into each job to make each man *want* to operate at peak performance. Incentives in part lie in psychological factors. However, every company should give serious consideration to directly relating a form of management incentive payment to management performance. Properly installed, this will provide the propulsion for the entire management effort. ■

This article is adapted from a talk presented at the AGA general management conference, March 25-27, at the Edgewater Gulf Hotel, Edgewater Park, Miss.

GAS associations

AGA forms special air conditioning committee

To help promote and sell residential, commercial and industrial gas air conditioning equipment, a 12-man committee has been organized by the American Gas Association. The AGA recently doubled its appropriation for gas air conditioning research during this year.

W. W. Selzer, director of business promotion for the Columbia Gas System Service Corp., serves as chairman of the new special task force group operating under the general promotional planning committee of the PAR plan.

Main objective of the committee is to coordinate the stepped-up efforts of industry research committees, gas air conditioning equipment manufacturers, and the sales and promotion organizations of utilities.

In addition to Mr. Selzer, these men make up the committee: W. D. Williams, New Jersey Natural; J. Robert Delaney, Cincinnati Gas; B. C. Adams, Jr., Gas Service Co.; Harold F. Carr, Baltimore Gas & Electric; H. William Doering, Springfield Gas Light; E. L. Henderson, United Gas Corp.; David J. Kerr, Southern Union; John S. McElwain, East Ohio Gas; Frank N. Seitz, Southern Counties; G. J. Tankersley, Gas Light Co. of Columbus; and R. J. Vandagriff, Laclede Gas.

Michigan Gas Association elects Ludwig president

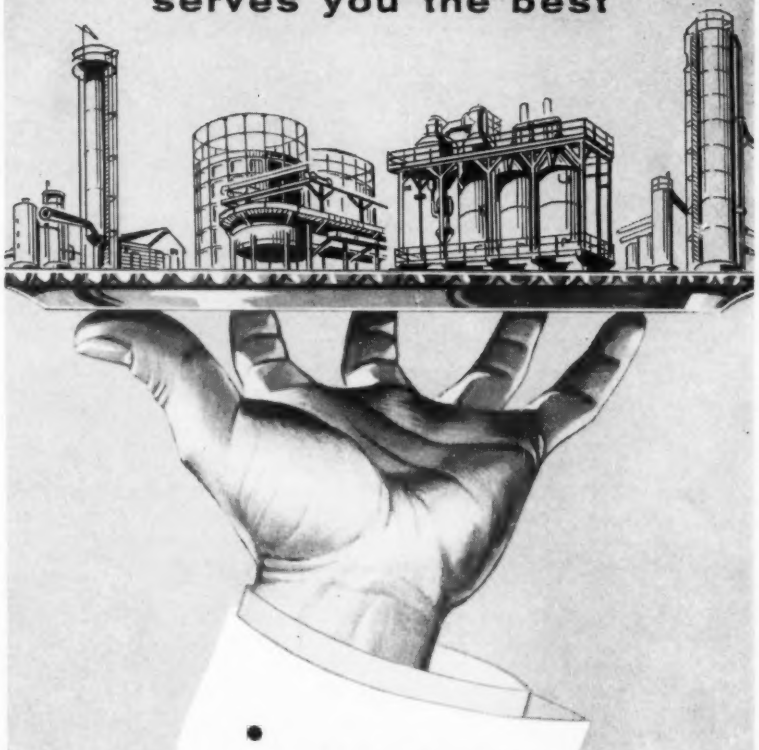
George E. Ludwig, general manager of Michigan Consolidated Gas Co.'s Muskegon district, is the newly elected president of the Michigan Gas Association.

Named vice president is L. L. Perry, vice president and general manager of Michigan Gas & Electric Co., Three Rivers. Milton G. Kendrick, sales manager of Michigan Consolidated's Ann Arbor dis-

for all gas plant needs

GASMACO

serves you the best



GASMACO is contributing to Canadian gas expansion with: Conversion and survey work for gas utility systems; conversion of large industrial plants; natural gas compressor and city gate stations; pipeline engineering and corrosion studies, appraisals, reports; purifiers and scrubbers; LPG systems; and industrial furnaces.

THE GAS MACHINERY CO. (CANADA) LTD., Hamilton, Ontario. The Gas Machinery Company, 16104 Waterloo Road, Cleveland 10, Ohio.

To be announced by Gas Machinery soon:
NEW equipment
NEW processes
NEW techniques

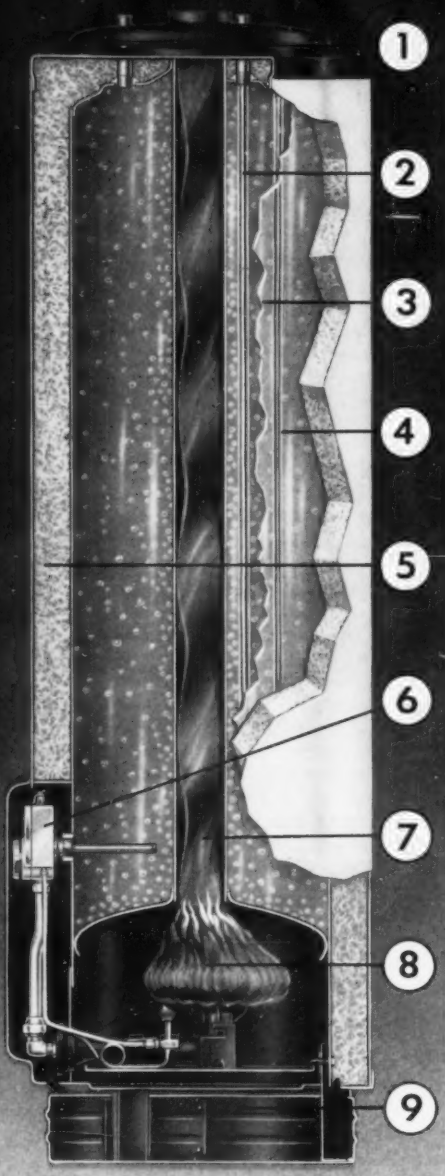
THE gas machinery COMPANY

GAS PLANT EQUIPMENT AND INDUSTRIAL FURNACES

NEW for '57 AMERICAN-Standard

9 reasons why American-Standard gas water heaters are the easiest to sell and install

1. BUILT-IN DRAFT DIVERTER—new low design takes less space—heater fits under low ceilings, aids efficient combustion and heat transfer.
2. FIBERGLAS COLD WATER INLET TUBE—gives no taste or odor—lets in cold water at lowest point in tank—can be installed in either water connection.
3. GLASS-LINED TANK—inside lining is rich protective coat of glass, prevents corrosion. Arcosteel models include new "*sigma weld*" which makes possible most thorough galvanizing ever produced.
4. MAGNESIUM ANODE—double protection for the tank—electrolysis reduces possibility of corrosion.
5. EXTRA-THICK FIBERGLAS INSULATION keeps hot water hot—cuts down heating bills.
6. FULLY AUTOMATIC SAFETY CONTROLS—if fuel fails, both pilot and burner go off automatically—for all gases—assure safe lighting.
7. CENTER FLUE—baffled to retain maximum heat inside tank—center location for strength in construction.
8. SINGLE-PORT CAST IRON BURNER—ultra modern, one-piece cast iron burner sweeps heat across entire bottom of tank—users get up to 25% more hot water.
9. SOLID RING-TYPE BASE—facilitates simple, one-man installation—modern in appearance—no dust collects under heater.



Arcosteel Standard

Arcosteel DELUXE

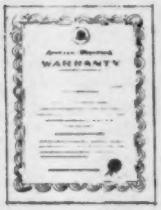
full-line GAS WATER HEATERS

Meet the needs of every customer with new super-fast heaters ... performance-rated to give up to 25% more hot water

Here's a completely new full line of gas water heaters with a size and model for every customer. These profit-makers are performance-rated to deliver the exact hot water needs of each customer's household. A simple, free chart tells you instantly which heater will meet all peak demands. Easy to handle, one man installs heater quickly. American-Standard quality and dependability eliminates costly callbacks. Four kinds of gas models, glass-lined and galvanized steel tanks, full range of sizes.

"You won't run out of hot water" is the hard-hitting slogan, being registered with millions of home owners to make American-Standard performance-rated water heaters a household name.

American-Standard Gas Water Heaters are easiest to sell because of . . .



The Warranty—American-Standard warranty, up to 10 years, gives customers greater confidence for quicker sales.

Solid support with advertising and promotions—American-Standard backs these to the hilt with effective, broad-coverage advertising and promotional support. Pre-sells your customers on the exciting new features of American-Standard gas water heaters.

FREE! PERFORMANCE-RATING GUIDE MAKES YOU LOCAL HOT WATER EXPERT

New and unique—it takes the guesswork out of estimating hot water needs. In seconds you can performance-rate a home and tell which gas heater to recommend. Performance-Rating Guide is far more accurate than depending on tank size or recovery of heater alone—makes American-Standard heaters the easiest to sell. Get your free chart today. Write for it now.

Arcoglas DELUXE

Arcoglas Standard

AMERICAN-Standard

PLUMBING AND HEATING DIVISION

American-Standard, Plumbing & Heating Division
39 W. 39th Street, New York 18, N. Y.

Please send, at no cost, your Gas Water Heater Performance-Rating Guide and further information on this complete, new line of water heaters.

Name_____

Business Address_____

City_____ Zone____ State_____

TWGG-87

trict, was reelected secretary-treasurer.

Members of the board of directors are W. R. Carolyn, retiring president, division manager for Consumers Power in Lansing; J. B. Simpson, assistant general supervisor for Consumers in Jackson; D. B. MacDonald, Saginaw division manager for Consumers; Karl E. Schmidt and Roland R. Paulin, Michigan Consolidated vice presidents; W. H. Huffmaster, general manager of Southeastern Michigan Gas Co., Port Huron; and D. M. Eckman, vice president and general manager of Battle Creek Gas Co.

New directors of the Canadian Gas Association were elected at the CGA's 50th annual meeting recently in Jasper Park, Alta. Shown here are (bottom row): H. C. Darroch (Moffats Ltd.), president; H. L. Purdy, (B. C. Electric), 1st vice president; and F. R. Palin (Union Gas), immediate past president. Top row: E. H. Rohrer (B. C. Electric); Oakah L. Jones (Consumers Gas); G. E. Downie (Wilcolator); O. E. Loberg (Gurney Products); A. J. Strain (Ruud); N. E. Tanner (Trans-Canada); C. L. Metcalf (Northwestern Utilities); K. Lucas (Quebec Natural); L. C. Whealy (Coleman Lamp & Stove); R. C. McPherson (Canadian Western Natural), 2nd vice president; G. M. Douglas (Union Gas). Directors not pictured: C. R. Hetherington (Pacific Petroleums); T. E. Cross (Quebec Natural); D. Cass-Beggs (Saskatchewan Power); J. R. Reeves (Dominion Natural), and F. W. Satchwill (Winnipeg & Central).

we've streamlined the regulator...
Now, a main burner and pilot load regulator with compressed dimensions . . . designed to fit into small areas on modern gas appliances where space is at a premium. Maxitrol's RV-30 is the answer because it is the smallest regulator of comparable capacity. Its streamlined oval shape compresses width dimensions without lowering capacity. Pilot flame regulation at extremely low flow rates is even more accurate and sensitive than AGA requires (120 BTU per hr. or 0.15 cu. ft. per hr.) The RV-30 offers you one low-cost regulator for either main burner or main burner-pilot load applications.
FOR PIPE SIZES:
3/8" x 3/8"
1/2" x 3/8"
1/2" x 1/2"
RV-30 APPLICATIONS
Clothes Dryers
Water Heaters
Incinerators
Industrial Pilots
Recessed Wall Heaters
Cottage and Trailer Heaters
Built-in Counter Top Ranges
Domestic Cooking Units
SEND FOR BULLETIN S-1011
MAXITROL COMPANY
12200 BEECH ROAD
DETROIT 39, MICH.

1957 industrial gas school scheduled for September

The biennial industrial gas school will be held during the week of Sept. 9 in the Penn-Sheraton hotel in Pittsburgh.

The school, sponsored by the AGA's industrial and commercial gas section, offers a five-day basic training course for new engineers and a refresher course for others in the sale and utilization of gas for industrial heat processes.

The main body of the course will be a series of technical lectures covering fundamentals of combustion, combustion systems, melting and heat treatment of metals, fuel applications in major industries, steam generation, liquid heating, instrumentation and protective devices, automation, air conditioning

ACTUAL SIZE

Robertshaw-Grayson

TSC-110

manual gas control
for low cost space heaters!

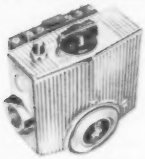
Now for the first time, ROBERTSHAW-GRAYSON announces a *new* manual control, the TSC-110... a low cost manual control for low cost, low capacity gas-fired space heaters. Switch your production to the new ROBERTSHAW-GRAYSON TSC-110 and you'll cut assembly line costs... gain added safety and dependability! The new TSC-110 installs easily, quickly, at low cost... requires a minimum of service on the job! Look at these features!

- Metal stop prevents accidental shut-off of pilot
- Standardized manifold piping cuts inventory expense
- 100% automatic shut-off of both pilot and main burner
- EXCLUSIVE—can be ordered with or without dust & gum filter

NEW! DEPENDABLE...SAFE!

A ROBERTSHAW-GRAYSON SPACE HEATER CONTROL FOR EVERY SPECIFICATION...

UNITROL 400E



For wall thermostat operations... the beautiful, automatic Unitrol 400E offers a complete, compact control... ideal for the vented, recessed wall heaters and small, competitive forced air units!

UNITROL 110S

...a low cost, automatic, **thermostatically controlled,** "Cold Air Return" control for gas-fired floor furnaces, wall heaters and console heaters... features the safety and dependability of an automatic, 100% shut-off safety pilot.

CALL, WRITE OR WIRE! *To find out more about the new* ROBERTSHAW-GRAYSON Manual TSC-110, *contact Grayson Controls Division today!*

Robertshaw-Fulton
CONTROLS COMPANY
GRAYSON CONTROLS DIVISION
LONG BEACH, CALIFORNIA

and heating, radiant spot heating, and installation practices. Typical modern industrial gas equipment will be displayed and demonstrated.

GAMA reports 10 new members

Ten companies have been elected to membership in the Gas Appliance Manufacturers Association.

They are: El-Mech Tools Ltd., Welland, Ont., Canada; Noland Tank & Galvanizing Co., Nashville; Metters Ltd., Perth, West Australia; Athens (Tenn.) Stove Works Inc.; Philco Corp., Philadelphia; CATITA S.A., Buenos Aires, Argentina; Oakland Foundry Co., Belleville, Ill.; Nu-Way Corp., Rock Island, Ill.; American Air Filter Co.'s Herman Nelson division, Louisville; and National Heating & Cooling Manufacturing Co., Columbus, Ohio.

Newly elected officers of the Indiana Gas Association are (from left): V. C. Seiter, Citizens Gas & Coke Utility, vice president; Lyman H. Bell, Hoosier Gas Corp., president; and R. A. Steele, Citizens Gas, secretary-treasurer.

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed

Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO...SPECIFY KRALOY PVC PLASTIC PIPE!

Representatives:
The Mott Co.—Dallas and Houston
H. J. Hodes—Kansas City, Mo.
Utility Specialties Service Co.—Jackson, Miss.
Southeastern Distributing Co.—Miami

Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*
4720 East Washington Boulevard, Los Angeles, California
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. Subsidiary

AGA issues gas range feature chart

A reference chart issued by the utilization bureau of AGA shows at a glance the availability of various features on today's gas ranges and the names of 31 leading manufacturers offering them.

Special features listed on the "Gas Range Feature Finder" are limited to those which are in greatest demand. The chart does not attempt to show combinations of these on specific models.

The chart has two pages of dimensions for built-in and stack-on units. Free-standing ranges are given in overall widths and depths. Colored enamel and metallic finishes are also indicated on the chart.

Robert Smith assigned to AGA air conditioning post

Robert B. Smith has been temporarily assigned to the AGA to fill the newly created post of manager of air conditioning research under the PAR plan. Mr. Smith is coordi-

nator of research for the Columbia Gas System Service Corp.

Mr. Smith has served on the AGA marketing research committee, Subcommittee 8 of B.31, and is an original member of the task group for air conditioning. In his new assignment, he will supervise the AGA's accelerated research program in air conditioning.

Gas Appliance Engineers elect new officers

Stan C. Marshall, of Minneapolis-Honeywell Regulator Co., has been elected president of the Gas Appliance Engineers Society. Other new officers are: vice president, D. R. Weidenfeller, Baso Inc.; treasurer, Keith T. Davis, Carrier Corp.; three-year trustee, M. J. Caparone, Grayson Controls Division.

Membership of the four-year-old organization now exceeds 175. Voting members are engineers with at least eight years' experience in the gas appliance industry, including three years of development engineering in gas appliances. Other (non-voting) grades of membership provide for admission of younger engineers engaged in gas appliance engineering, and non-engineers of recognized leadership in work related to gas appliance engineer.

Comparing notes during the AGA-PCGA public relations workshop in Salt Lake City are (from left) S. E. Cowan, Mountain Fuel Supply; James D. MacFarland, Southern Counties Gas Co., and chairman of the workshop; and chairman-elect J. Wilson Gaw, Washington Natural Gas Co. Sixty-five utility, pipeline, and LPG representatives attended the workshop.

Attachments Make the Hydrohoe A Gas Utility Specialist

Here is just the excavator you need for emergencies and scattered maintenance jobs — a Bucyrus-Erie Hydrohoe with special attachments for gas work.

This lightweight, all-hydraulic dragshovel is equipped optionally with a combination independent power unit-air compressor and the air tools it powers. The Hydrohoe carries everything necessary to make quick work of leak repair jobs, trenching for mains or house connections, digging inspection, valve or anode pits, plus dozens of other jobs.

Mounted on a new or used commercial truck, it gives you big-machine muscle that lets you dig deep, fast, precisely . . . plus mobility that's unmatched by any excavator available today — big or small. There is plenty of force at the dipper lip for penetration in tough materials. With the Hydrohoe, you load directly to trucks — no need to rehandle material.

In addition, the Hydrohoe offers unequalled flexibility with standard, narrow or wide wrist-action dippers or the specially-designed utilities dipper. This dipper rotates 95 degrees at the handle to dig short, deep holes quickly. With it you can cut square corners, even undercut the sides of the pit.

Your Bucyrus-Erie distributor can tell you about gas companies that have found Hydrohoes ideal for their work — see or call him today. 197H57

A Familiar Sign . . BUCYRUS ERIE *at Scenes of Progress*

SOUTH MILWAUKEE, WISCONSIN

GAS news

Antitrust charges filed against El Paso and PNW

Charges that the acquisition by El Paso Natural Gas Co. of Pacific Northwest Pipeline Corp. violates Section 7 of the Clayton Antitrust Act have been filed by the Justice Department in the U. S. district court at Salt Lake City, Utah.

According to the department's antitrust division, the acquisition eliminates the only major pipeline competitive with El Paso in the purchase of gas in the San Juan basin, and other basins, and the only major pipeline competitive with El Paso in the sale of gas in several western states. Thus, the complaint states, the purchase may "substantially lessen competition or tend to create a monopoly."

It also alleges that Pacific has the only facilities in the far west for importation of gas from Canada. The combination of the two firms, the department believes, will enhance El Paso's position to the extent that potential competitors may be permanently excluded.

Louisville Gas adds to storage capacity

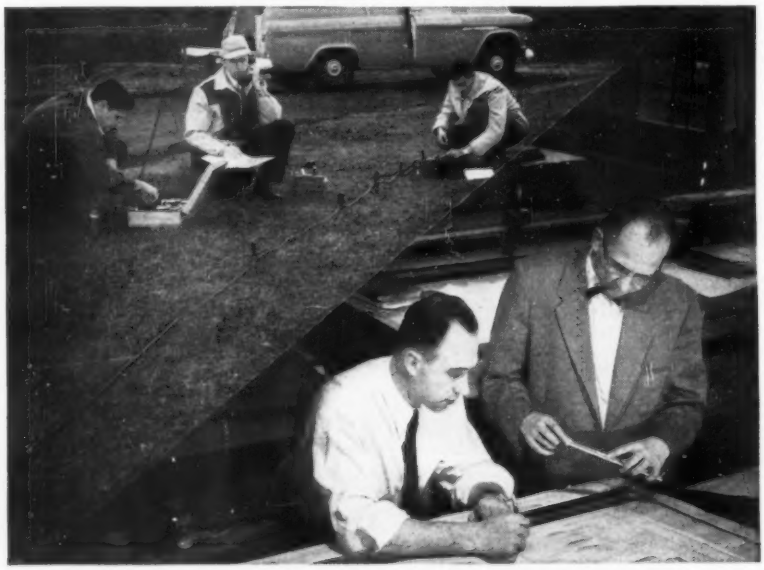
Louisville (Ky.) Gas & Electric Co. has acquired underground gas storage sites which will hold an estimated 3 billion cu ft of natural gas when completed.

The sites, located in Green, Hart and Larue counties, total about 3200 acres and include 20 gas wells and appurtenant equipment. When completed, the project will raise Louisville's total underground storage capacity about 8 billion cu ft.

Natural gas authority proposed in Carolina

Legislation has been introduced in South Carolina calling for the creation of the Upper Savannah River Valley Natural Gas Authority to furnish gas service in Abbeville county.

Under the bill, the authority



E. R. P. CATHODIC PROTECTION . . .
individually designed for each application

An effective installation that operates at the lowest cost per year requires experienced engineering evaluation of site and environmental conditions. The Electro Rust-Proofing Engineering Division makes available to you the cumulative experience gained in designing more than 10,000 cathodic protection systems.

Electro Rust-Proofing can furnish any one, or all, of the following services to help you provide proper cathodic protection for each of your jobs:

- Corrosion surveys and recommendations
- Design based on engineering experience
- Cathodic protection equipment and installation
- Service to assure proper operating results

For additional information write today.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

E-35R

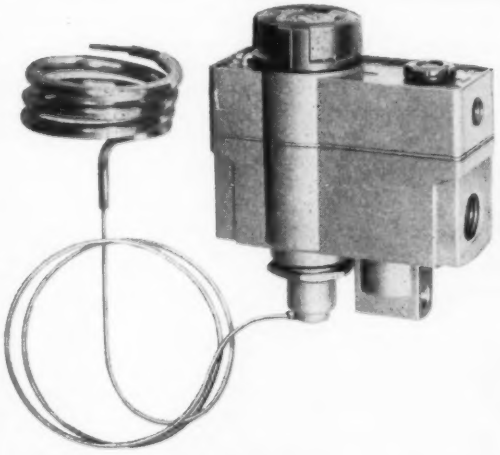
Auburn Smith (left), industrial engineer for Ohio Fuel Gas Co., received a commendation from the Columbus division of smoke regulation and inspection. Harold C. Johnson, chief smoke regulation engineer for Columbus, made the presentation. Mr. Smith and his staff conducted a series of meetings on commercial and industrial gas boilers, consuming 1 Mcf or more per hr. Scores of engineers, contractors, dealers, technicians and factory representatives attended the clinic.

IF YOU MAKE OR SERVICE

SMALL SPACE

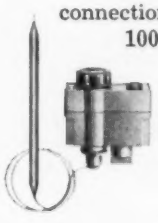
GAS HEATERS

Take advantage of interchangeable mounting... cut costs... use compact, flexible General Controls Gas Space Heater Controls



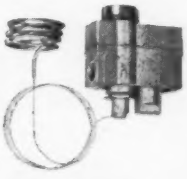
G-24 the ultimate in space heater controls with a combination modulating and snap, hi-lo-off type thermostat and General Controls' exclusive HI-FIRE Ignition.

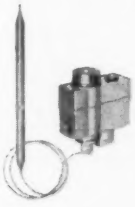
Designed specifically for the small space heater, this series of space heater controls is interchangeable... self-contained... with *matching* dimensions and mounting requirements. Reduces cost of installation and permits interchangeability of units without altering original pipe connections. Each of these controls provides 100% thermo-magnetic safety shutoff.



G-21 combination **manual** hi-low-off or on-off burner control with thermo-magnet safety valve only.

G-22 combination snap-action (on-off) **thermostatic** valve.





G-23 combination modulating thermostatic valve to adjustable low fire bypass.

GENERAL CONTROLS

America's Finest Automatic Controls for Home, Industry, and the Military

Glendale, California · Skokie, Illinois

Five Plants — 40 factory branch offices serving the United States and Canada

QUALITY AND DEPENDABILITY THROUGH RESEARCH

This Quantometer at Standard Magnesium means

POSITIVE QUALITY CONTROL

At the Tulsa plant of Standard Magnesium Corp., this Quantometer analyzes magnesium faster—and to a greater degree of accuracy (within .0001%) than any other method.

What does this mean? . . . First, because of its great accuracy, it assures consistent high quality. This means material to your exact specifications because a sample of every melt is analyzed before pouring.

Secondly, it gives a printed analysis in a matter of seconds from samples speedily delivered from the mill to the lab through pneumatic tube systems. Other metal analyzing methods rely on a time consuming, error-liable human analysis of results.

This *positive quality control* is but another reason why Standard Magnesium Corp. leads in *quality and dependability.*

QUALITY AND DEPENDABILITY THROUGH RESEARCH

Standard Magnesium Corporation
TULSA, OKLAHOMA

MAGNESIUM INGOT • MAGNESIUM ANODES • MELTING FLUX

100% Sales Acceptance on FREE Trial Offer

of the all new Fisher "Electronic Witch" M-SCOPE Pipe Finder

10 DAYS FREE TRIAL

In your field, 100% of those who take the famous "Electronic Witch" on FREE TRIAL actually purchase it! Here is absolute proof of unsurpassed performance. Outperforms any pipe locator on the market regardless of price. Test this new Pipe and Cable Finder under YOUR actual working conditions. State on your company purchase order that you want 10 day FREE TRIAL OFFER. Your only expense is the nominal shipping charge.

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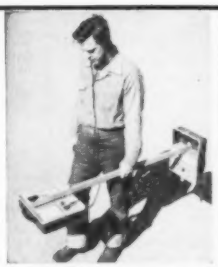
Geophysical Instruments Since 1932



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with indestructible Fiberglas cabinets.

Send for FREE 1957 CATALOG Complete Pipe Finding, Leak Detecting and Corrosion Control Equipment.

would have power to buy, lease, mortgage, and sell property; purchase, manufacture, produce, and transport supplies of natural or manufactured gas; fix terms and rates; make use of county and state highway rights-of-way in which to lay pipes and lines; employ persons or corporations to operate its system for any period of time; and to borrow money and issue negotiable bonds payable from all or any part of the revenues derived from the operation of its system.

Profit-in-management seminar planned by GAMA

A management development seminar on "Profit Making Techniques in Management" will be sponsored by GAMA on Aug. 7 at the AGA Laboratories in Cleveland.

John D. Corrigan, who was a featured speaker at GAMA's annual meeting in Greenbrier, will conduct the seminar.

Peoples Gas pays $1850 for employee suggestion

Thaddeus A. Zamirowski, a supervisor of service and fitting at Peoples Gas Light & Coke Co., is $1850 richer for suggesting that aluminum tubing be substituted when repairing copper tubing in automatic gas water heaters and space heating equipment.

The award is the largest given by Peoples Gas in the 33-year history of its employee suggestion system, and the second largest ever presented by a member of the

Eskil I. Bjork (left), Peoples Gas chairman, presents $1850 check to Thaddeus A. Zamirowski for a suggestion to substitute aluminum tubing when repairing copper tubing in automatic gas water heaters and space heating equipment.

public utility group in the National Association of Suggestion Systems.

Peoples Gas, after a year of study, estimated that Zamirowski's suggestion would reduce the number of service calls per year by 3147. Earlier he was presented with a preliminary award of $50.

Peoples Gas pointed out that aluminum tubing is just as safe as copper and also that sulfur compounds in natural gas have no corrosive effect on aluminum.

Arizona utility merging with Southwest Gas

Merger of Natural Gas Service Co. of Arizona with Southwest Gas Corp. of California and Nevada has been approved by the boards of both companies.

According to joint announcement by Southwest President Harold G. Laub and NGS President P. P. Stathas, the proposal will be submitted to stockholders in the near future.

Terms of the merger were not revealed, but the announcement stated that Southwest will be the surviving company.

Natural Gas Service serves some 15,000 cupstomers in mining and agriculture areas of Arizona, including the towns of Clifton, Morenco, Superior, Hayden, Casa Grande, Coolidge, Eloy, Florence, and Maricopa. Southwest serves customers in the Greater Las Vegas area and in the Victorville, Barstow, Appley Valley, and Lucerne Valley areas of California.

University of Texas schedules gas school

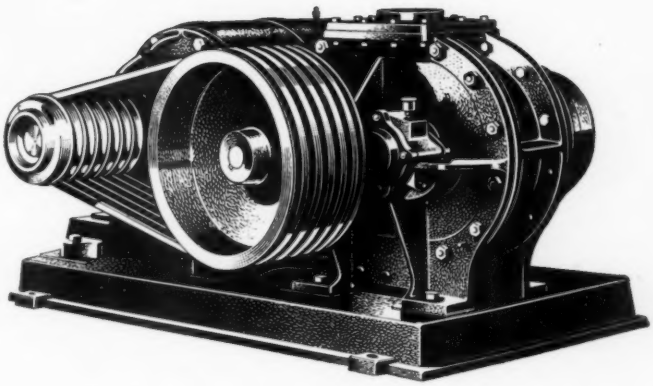
The University of Texas petroleum extension service will conduct a school of gas technology in Houston in the fall.

The new six-week course in natural gas production, gathering, regulation, purification, and transmission will open Oct. 14. Sponsoring the school are the university's petroleum extension service and the Texas Education Agency trade and industrial service.

Public Service helps New Jersey colleges

Gifts totaling $13,500 have been presented to New Jersey colleges by Public Service Electric & Gas Co., Newark. The money also will aid students in the territory served by the company.

Board chairman Lyle McDonald



R-C gas pumps eliminate friction and leakage problems

One of the many operating advantages of Roots-Connersville rotary positive displacement gas pumps are the exceedingly small losses due to leakage and friction. This high efficiency is assured by the inherent design of the pump in which the impellers operate without internal contact. Yet so accurately gauged are the clearances that slippage is reduced to an absolute minimum. Maximum power savings are realized since horsepower required is determined by operating pressure.

From 5 to 50,000 cfm, these pumps assure positive control of both volume and pressure. Design simplicity further assures long term peak performance with little down-time and maintenance held to a minimum.

Available in 76 capacities and sizes, R-C rotary gas pumps can be exactly matched to your requirements. For engineering data, write for Bulletin 32-33-B-13 or Bulletin 31-B-17 on small pumps.

Engineers—unusual career opportunities await you at Roots-Connersville. Address your resume to Professional Employment Manager.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

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CORROSION PROBLEMS?

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- **ADAPTER FITTINGS** (patented) enabling you to tie in metal and plastic service.
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GAS METER INDEXES

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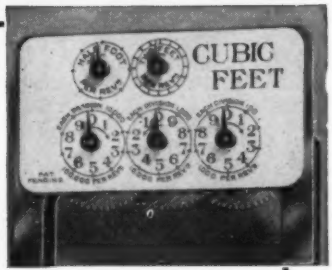

Serving the Industry for over 30 Years

Inquiries Invited On Replacement Indexes

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said the gifts serve a threefold purpose: to aid the state, to assist colleges, and to answer the company's own need for college-trained personnel.

Of the total allotted, $1500 each goes to the Newark College of Engineering, Princeton University, Rutgers University, and Stevens Institute of Technology. The New Jersey College Fund Association gets $7500. Three scholarships for four years of study also are awarded.

CL&P launches higher education aid plan

Under its "aid to higher education program," Connecticut Light & Power Co. will match any contribution up to $500 made by an employee to any privately financed college or university.

In addition to duplicating employee contributions to colleges and universities, the Berlin, Conn.—based utility makes eligible alumni funds, foundations, or associations connected directly with the institution of the employee's choice. CL&P also will match any employee donations to tax-supported colleges or universities if the donations are to be used solely for scholarship funds or other financial aids to students.

Integrated system planned by Washington Natural

Washington Natural Gas Co. has contracted to sell 7 MMcf/day of natural gas to American Smelting & Refining Co. In order to supply the smelter, Washington Natural must be able to shift gas from one part of its system to another as demand indicates. This need will make Western Washington the Northwest's largest population area served by an integrated natural gas distribution system, according to B. T. Poor, Washington Natural's executive vice president and general manager.

The company will install 11 miles of line from its Dieringer city gate station to Auburn and Kent to augment present supply facilities and interconnecting its northern and southern division territories. It will also install 4½ miles of supply line in Tacoma from Fircrest to Ruston.

"For operating flexibility, this inter-tie is most important. We will have an interconnected and com-

pletely integrated distribution system from Marysville to Tumwater," Mr. Poor said.

Engineering has begun for the new $700,000 facilities. Completion is planned for late summer or early fall.

H. B. McNichols

James Chrisman

Appalachian measurement course scheduled

Principal speakers have been lined up for the 17th annual Appalachian gas measurement short course scheduled for Aug. 26-28 at West Virginia University in Morgantown.

C. S. Stackpole, managing director of the AGA, will present the principal address. Dr. Irvin Stewart, president of the university, will deliver the address of welcome and Hale Watkins, secretary of the West Virginia Oil & Gas Association, will respond.

The course has been designed to provide information on application, operation and repair of natural gas quantity measurement and pressure regulation equipment. The latest developments in this equipment will be displayed by 45 leading gas equipment manufacturers.

H. B. McNichols, Columbia Gas System Service Corp., is general chairman of this year's program. Program chairman is James W. Chrisman, East Ohio Gas Co.

Northern Illinois awards $1500 in employee contest

Fifteen hundred dollars was presented to 30 Northern Illinois Gas Co. employees in the company's recent employees' prize paper contest.

Top money man was Daniel Mathews of Bradley. He won $500 for his paper, "3043 Anywhere." He described his truck No. 3043 as his home and other members of the crew as his immediate "family." The family relationship extended through the other employees of the gas company to the "more distant

Look what Trenchmobile® can do for you

On house-to-street service connections, Parsons 88 Trenchmobile makes vertical set-ins, flush with foundations. Hinged crumber swings up, out of the way — positive down-crowd boom starts cut fast, holds accurate grade. It also undercuts walks, curbs, cross-pipes, saves costly hand clean-up. Shiftable, reversible spoil conveyor dodges trees, hedges, poles, and other side obstructions. On many operations, Parsons Trenchmobile backfills its own trench — 6-foot blade optional.

Digs 8 to 16 inches wide

When your work schedules call for main-line extensions, pipe reclamation, or trouble-shooting, this utility-size trencher has plenty of capacity to fill the bill. You get trench widths from 8 to 16 inches, depths to 5 feet. Digging speeds range from 0 to 14.5 feet per minute.

Self-sharpening "Tap-In" teeth assure maximum digging efficiency at every depth, width, in all materials. Hinged crumber sweeps trench bottom clean, ready for pipe. Consider, too, what Trenchmobile's rubber-tired mobility can mean on your scattered trenching jobs.

Drives anywhere

A job 6 miles away can be started in less than 30 minutes from "now". Trenchmobile drives around town at 12.6 m.p.h. There's no waiting for trailer — and no loading or unloading delays.

Better see your Parsons distributor soon, or send for Trenchmobile catalog. (Also check Parsons big, crawler-mounted Trenchliners®.)

Want more facts?

mail to: PARSONS Company, NEWTON, IOWA (Koehring Subsidiary)

Send us latest catalog on rubber-tired 88 Trenchmobile.

NAME ..... TITLE .....

COMPANY ..... DIV. .....

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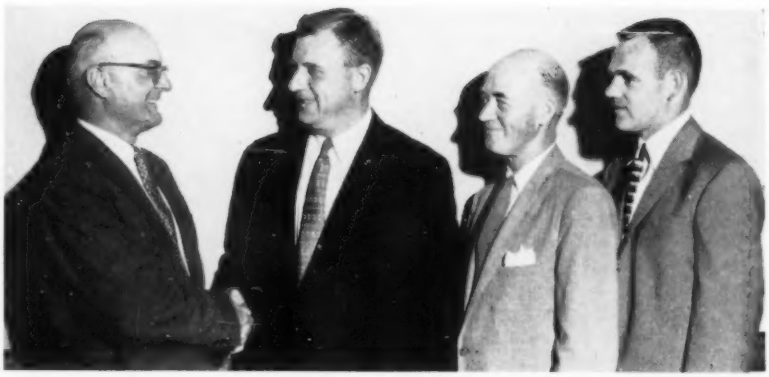
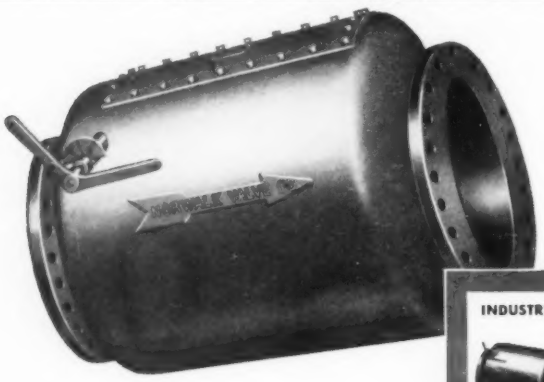
relatives" in other parts of the gas industry.

Second-prize money of $250 went to Bruce Gilbert of Wheaton, who won for his paper entitled "The Northern Illinois Gas Company Takes a Deep Look at Its Propane Storage Problem Through Green Tinted Glasses." Evanston's Frank Sheridan won the $100 third prize for his paper, "New Gas and Sales Load with Gas Incineration."

In addition to the top three, there were five $50 awards, 12 $25 awards, and 10 $10 honorable mentions.



Northern Illinois' president Marvin Chandler (left) congratulates top winners in the utility's prize paper contest. From left: Dan Mathews, first place; Frank Sheridan, third place; and Bruce Gilbert, second place.



5 more of these 36" babies...

Norwalk *Engineered* to keep gas and air under positive control

We are proud of the reorders we receive. As a result of past experience, five more of these big Norwalk check valves, 5 feet long and engineered for 36" pipe diameter, are being installed by one of our good customers.

In pipe sizes from ⅜" to 42" or larger, Norwalk valves give dependable service with exceptionally low pressure drop, at practically no maintenance cost.

For engineering assistance and quick service in controlling gas and air flow at high or low pressures—

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Check Valves
Pipe Sizes ⅜" to 42"
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Pipe Sizes ½" to 2".

Station Regulators
Pipe Sizes 3" to 24". Liquid Seal or Diaphragm Types.

Relief Valves
Pipe Sizes ½" to 24".

Filters
Pipe Sizes ½" and up.

Complete Engineering Cooperation

Bing Crosby joins in appliance campaign

Capitalizing on Bing Crosby's identification with "White Christmas," the gas industry will use The Groaner himself to launch its biggest merchandising campaign.

Bing will urge consumers to "Make it a White Christmas . . . give her an automatic gas appliance." The campaign is slated to roll into high gear during November and December.

Close to 400 gas utilities are behind the national campaign at the local level. Also participating are gas appliance manufacturers and dealers from coast to coast.

S. F. Wikstrom, director of AGA's promotion and advertising, said that Crosby will deliver four TV commercials featuring automatic gas appliances on "Playhouse 90." These commercials will also be available for local use.

In addition to his TV appearances, Crosby will be featured in full-color, full-page ads in national magazines. Supplementing this will be extensive advertising in newspapers, trade journals, and general retailing and dealer publications.

Safety record improves for ninth straight year

An all-time low figure of 8.68 disabling injuries per million manhours worked was established by the gas utility and pipeline industry in 1956.

According to the annual report of the AGA's accident prevention committee, this marks the ninth successive year in which the record was improved. The figure compares with the post-war peak of 21.86 in 1947 and the best previous mark of 10.17, posted in 1955. The committee report was based on returns from 407 companies representing 94 per cent of the industry's total of about 200,000 workers.

Accident severity also reached a new low. The severity rate—number of days charged to disabling injuries per million man-hours worked—dropped to 652 for a 6 per cent improvement over the previous year. The peak year for severity was also 1947, when the figure was 1277—nearly double last year's record.

Niagara-Mohawk extending system

Five New York communities will have gas service when Niagara Mohawk Power Corp. completes its $1 million gas line to Ellisburg.

Natural gas at Ellisburg will come from the line which extends from a point near Fulton to Watertown. A regulator station will be built near Pierrepont Manor to reduce pressure for distribution in the area.

Regulator conference attracts 65 gasmen

More than 30 distribution and pipeline companies sent 65 representatives to Fisher Governor Co.'s gas regulator conference held recently. Classes conducted by sales and engineering personnel covered design, production and maintenance of gas regulators. A tour of the Marshalltown, Iowa, factory and offices was included.

Sending representatives were these companies: Louisville Gas & Electric, New Orleans Public Service, Atlanta Gas Light, Southern California Gas, Central Hudson Gas & Electric, Milwaukee Gas Light, Texas Gas Transmission, Niagara Mohawk Power, Winnipeg & Central Gas, Saskatchewan Power Co., Worcester Gas Light, Springfield Gas Light, Arkansas-Louisiana Gas, Western Kentucky Gas, Cambridge Gas, New Bedford Gas & Edison, Northwestern Utilities, Minneapolis Gas, Peoples Natural Gas, Michigan Consolidated, Fall River Gas, Michigan-Wisconsin Pipeline, British Columbia Engineering, Consumers Gas, United

Veteran operator Delbert Corman "at ease" while his Cleveland is digging gas and water lines for a Lexington, Ky. subdivision.

Cleveland's exclusive multi-speed transmission provides right power/speed ratio for every job

"For easy handling and dependable digging even under the toughest trenching conditions give me a Cleveland every time," says long-time heavy equipment operator Delbert Corman of Aldridge & Poage Co., Lexington, Ky., owners of 3 Clevelands. Thousands of trench operators and owners throughout the world agree with him. Credit for this world-wide preference for Clevelands is due to the perfectly balanced combination of practical performance-proved features found in every Cleveland. Practically every modern trencher feature originated with Cleveland. But no single trencher feature ever developed is the equal of Cleveland's exclusive multi-speed crawler transmission.

For *each* of 4 digging wheel speeds this transmission provides 12 individual crawler speeds forward and 12 reverse, all closely and evenly graduated. The 48 forward speeds give the operator a choice of over 30 *practical* digging speeds—over 30 usable *combinations* of digging wheel and crawler speeds, providing the *right* combination of power and speed for digging every soil, under every digging condition. The following table of non-slipping, power-saving digging speeds for the Cleveland 95 is typical.

Cleveland's exclusive multi-speed transmission has no equal

For each of 4 wheel speeds	there are 12 individual crawler speeds											
With Main Transmission (and Digging Wheel) in	SPEEDS (in Feet per Minute) — Available in Either Direction (Bold Face Indicates Most Commonly Used Digging Speeds)											
First Speed	.5	.7	1.1	1.5	2	2.8	3.4	4.7	5.9	12.6	22.5	38
Second Speed	1	1.4	2.2	2.9	3.9	5.3	6.6	9	11.5	23.8	43	73
Third Speed	2	2.8	4.3	5.8	7.8	10.6	13.3	17.9	22.8	47	86	146
High Speed (Ordinarily used when digging)	3.3	4.6	7.1	9.5	12.8	17.5	21.7	29.6	38	78	143	240
Reverse (not used when digging)	.4	.6	.9	1.2	1.6	2.2	2.7	3.7	4.8	9.9	18	30

THE CLEVELAND TRENCHER CO.

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Good Everywhere

Fuel, Central Kentucky Natural, Lowell Gas, Spokane Natural, Vancouver Island Gas, and Long Island Lighting.

New group services recording chart field

A $6 million holding company has been formed by five major specialty printing firms and a national sales organization to meet increased printing needs in the rapidly expanding fields of factory instrumentation and office automation.

Participating in the plan are Technical Charts Inc., Buffalo, N. Y., supplier of both circular and strip recording charts; Staebler & Baker Inc., Clayton, N. Y.; Staebler & Baker Ltd., Gananoque, Ont., Canada; and Technical Sales Corp., Detroit. The latter three are all in the instrumentation recording field. Rounding out the new organization are the firms of Clarkson Press Inc., Buffalo, a continuous forms printer; and Amherst Printing Co. Inc., also in Buffalo, producer of non-continuous business forms and other types of specialized commercial printing.

ACF forms new division, realigns products

As part of a major realignment of ACF Industries' products and plants, a new operating division has been established.

The new division, Advanced Products Division, will concentrate on manufacture of products for the gas, petroleum, chemical and nuclear energy industries.

Personnel and facilities of the ACF plants in St. Charles, Mo. and Milton, Pa. will be assigned to the new division, according to ACF's president, James F. Clark.

Rudolph Furrer, ACF vice president of manufacturing and engineering, will serve also as president of the new division.

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BETA CHART PENS
...HOLD 2 to 4 TIMES MORE INK
Beta Fountain Pens hold two to four times the ink of ordinary chart inking pens. Regardless of the line thickness Beta Pens produce a smooth unbroken and uniform line. Pens shown are approximately actual size and can be arranged to reduce time interval between static and differential lines to only a few minutes. Beta Pens are especially suitable for seven day records. Price $1.20 (lower prices in quantities).
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Available for Early Delivery
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GAS news notes

Oronite Chemical Co., San Francisco, has moved its Texas district headquarters from Dallas to Houston. The new office is located at 2472 Bolsover road.

Seamless Rubber Co., New Haven, Conn., has bought the plastic pipe fittings firm of E & A Sales Inc., Los Angeles. Don Roberts will be sales manager of the new operation.

Heath Survey Consultants Inc., Wellesley, Mass., has set up a new Canadian company. Known as Heath Survey Consultants Ltd. of Canada, the new operation is located in Sarnia, Ontario.

One hundred and forty-one sales and service engineers have been added to its offices during the past six months by Minneapolis-Honeywell Regulator Co.'s industrial division. The new men, assigned to some 90 offices, are all graduates of the division's 22-year-old instrumentation education center in Philadelphia.

Young Radiator Co., Racine, Wis. and Mattoon, Ill., has appointed Flournoy & Everett Inc. as engineering, sales and service representatives in southern California. Flournoy & Everett, located in Downey, Calif., will handle Young shell and tube heat exchanger products.

New!

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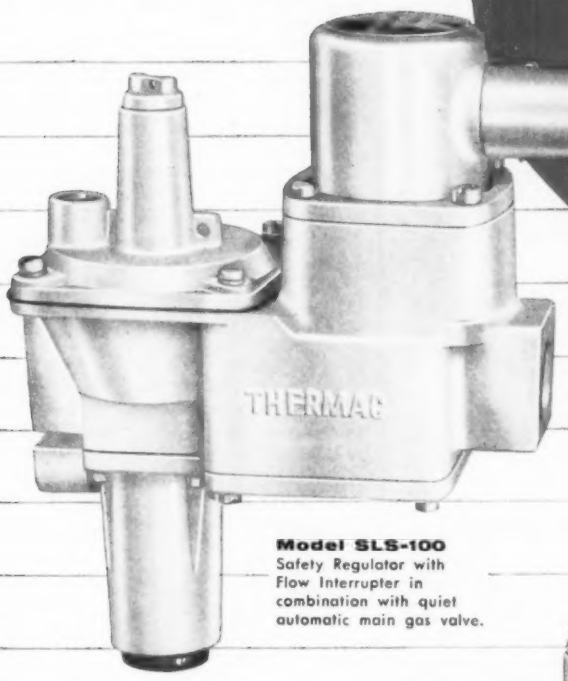
GAS APPLIANCE CONTROLS



Model SLS-100
Safety Regulator with Flow Interrupter in combination with quiet automatic main gas valve.

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Safety Regulator without Flow Interrupter in combination with quiet, automatic main gas valve.

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news • *Continued*

American Meter Co. has absorbed its wholly owned subsidiary, Philadelphia Pump & Machinery Co. It will be known as the Philadelphia Pump Division. Robert J. Browne is chief engineer and general manager and Louis G. Alaman continues as sales manager.

Thermac Co. has moved into new factory in Corona, Calif., approximately 50 miles east of Los Angeles. The 60,000-sq ft building located on a 10-acre site houses the entire Thermac operation under one roof. This includes engineering, laboratory, foundry, die casting, machining facilities, and complete testing equipment. This move marks the sixth time Thermac has expanded its operations in 25 years.

Construction is under way on the $1 million model foundry of W-K-M division of ACF Industries Inc. The foundry and associated buildings will be on an 80-acre site in the Rosenberg-Richmond area, near the W-K-M plant in Missouri City, both of which are just outside of Houston.

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GAS people

E. Emerson Jr.
N.Y. State Natural

Louis James
Lone Star

LOUIS G. JAMES is a vice president of Lone Star Gas Co., Dallas, and its wholly owned subsidiary, Lone Star Producing Co. Mr. James will continue to hold the post of comptroller for Lone Star.

New appointments by Columbia Gas System Service Corp., New York, include the promotion of WILLIAM H. HOWARD to the post of assistant supervisory engineer. He will also be system sponsor for Columbia's Pittsburgh group companies. ALFRED E. TOWNSEND has joined the transportation department of the service corporation to coordinate motor vehicle operations.

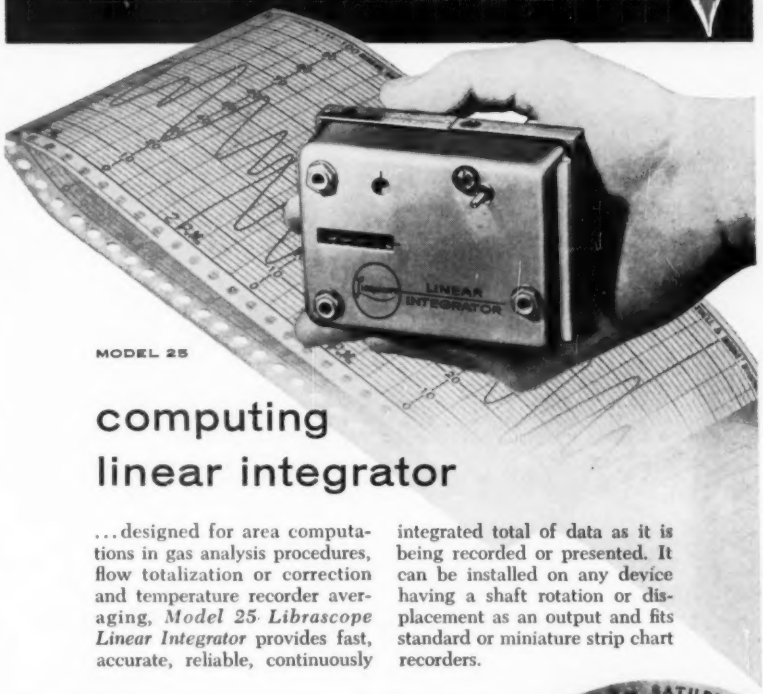
EDWARD EMERSON JR. has been named employee relations manager of New York State Natural Gas Corp., Pittsburgh. He will supervise personnel administration and labor relations, the safety program, annuities and benefit administration, wage and salary administration, and job training. He will be assisted by DONALD T. SHERRILL, DARWIN E. WHIPKEY, and WILLIAM G. HEINRICH.

The board of directors of Robertshaw-Fulton Controls Co. elected THOMAS T. ARDEN as president and JOHN A. ROBERTSHAW chairman of

J. A. Robertshaw
Robertshaw

T. T. Arden
Robertshaw

automatic
flow computation
for the GAS INDUSTRY



MODEL 25

computing
linear integrator

...designed for area computations in gas analysis procedures, flow totalization or correction and temperature recorder averaging, *Model 25 Librascope Linear Integrator* provides fast, accurate, reliable, continuously integrated total of data as it is being recorded or presented. It can be installed on any device having a shaft rotation or displacement as an output and fits standard or miniature strip chart recorders.

PRESSURE COMPENSATED
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flow computer

...made by Librascope, simplifies computations in the orifice measurement of fluids in gas well, lift, transmission and distribution operations. It provides continuous square root integration of static and differential pressure, eliminating expensive time costs and inaccuracies of hand integration.

Write for detailed bulletins on both Librascope Computers

MODEL 90

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COMPUTERS
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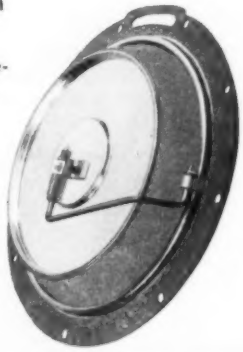
GENERAL PRECISION EQUIPMENT CORPORATION

No Margin for Error

Lancaster S-700 Complete Diaphragm
for small meters

When it comes to accurate gas measurement, you can't beat the smooth, floating action of a diaphragm that is perfectly centered in the meter.

That's one reason why so many meter shops are switching to Lancaster's complete diaphragm with the built-in adjustable carrier wire assembly. Send for a sample and test it for accuracy.



Illinois Central Photo

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people • *Continued*

the board. Newly formed is a three-man executive committee headed by RICHARD S. REYNOLDS JR., former chairman of the board. Mr. Arden and Mr. Robertshaw are also members. Mr. Arden has been executive vice president of the company since 1947. He has been in charge of the western operations of the company, which include two manufacturing divisions and a research center. Mr. Arden is active in industry affairs, serving this year as president of the Pacific Coast Gas Association. Mr. Robertshaw, president of the company since 1947, has served as president of Robertshaw Thermostat Co., Grayson Heat Controls Ltd., and American Thermometer Co.

GUY T. HENRY, president of the East Tennessee Natural Gas Co., Knoxville, has succeeded R. LESLIE FLETCHER as president of the Providence (R.I.) Gas Co. Mr. Fletcher has been associated with Providence since 1918 and has served as president since 1948. He will remain as a member of the board of directors. Mr. Fletcher was awarded the Meritorious Service Medal of the AGA in 1939 in recognition of his work in maintaining gas supply to about 95 per cent of urban users during the 1938 hurricane.

CHARLES N. PERRY, purchasing agent for Rockwell Manufacturing Co.'s Oakland (Calif.) plant for the past five years, has been named factory manager of the company's new Porterville (Calif.) plant.

RUSSELL L. SYLVESTER, chief engineer of Rockwell Manufacturing Co.'s central valve research and development department, has been promoted to engineering executive assistant of Republic Flow Meters Co., Chicago, newly acquired Rockwell subsidiary. In his new capacity, Mr. Sylvester will assist Wil-

R. L. Sylvester
Republic Flow

Charles Perry
Rockwell

liam F. Crawford, vice president of Rockwell and Republic and president of Edward Valves Inc., who is responsible for coordination of all Rockwell and Republic operations.

HARRY M. THOMPSON has been appointed supervisor, product information and sales training for the industrial division of the J. I. Case Co., Racine, Wis.

Robertshaw-Fulton Controls Co. has named CHARLES E. SMITH to the post of assistant national service director. Mr. Smith formerly was manager of the product service division of A. O. Smith Corp. Primarily, his duties will be to establish and expand training program for utility, distributor and retail servicemen. He will headquarter at Youngwood, Pa.

E. FRED LOCKARD and THOMAS DEBEVOISE has been appointed divisional managers of the Peoples Natural Gas Co., Pittsburgh. Mr. Lockard will have charge of the northern division, comprising Blairsville, Indiana, Kittanning, New Kensington, and Vandergrift. Mr. Debevoise will oversee operations in the company's eastern division, composed of Johnston and Altoona.

JOHN G. WILLIAMSON has been named general manager of the gas department of the Kansas Power & Light Co., Salina, Kan. He succeeds the late Clifford E. Brock. Since joining Kansas Power in March 1956, Mr. Williamson has served as superintendent of gas operations.

V. C. MICKLE has been appointed a special representative in the well drill sales division of Bucyrus-Erie Co., South Milwaukee. He will work on special assignments. The company also has named OTTO J. MEUSER industrial relations manager of the drill di-

E. F. Lockard
Peoples Natural

Thomas Debevoise
Peoples Natural

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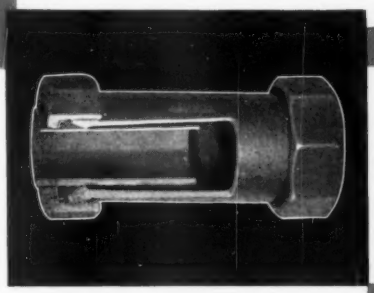
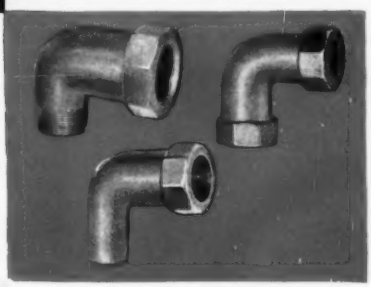
Couplings, Sleeves and Fittings for ☆ UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.

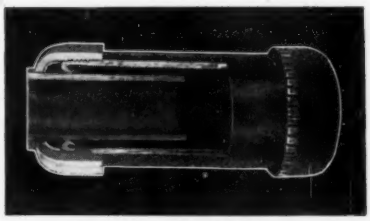


NORMAC COUPLINGS
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.



COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.



NORMAC #50-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.

Normac also manufactures a complete line of red brass fittings in O.D. sizes: ⅝", ⅞", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
919 North Michigan Avenue — Chicago 11, Illinois

Couplings Meter Bars Sleeves Cocks Ball Joint Clamps Service Tees & Ells

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

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Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.
Division of GREENLEE BROS. & CO.
1948 Columbia Avenue, Rockford, Ill.

vision. The company's drill division will be located in a new plant being built in Richmond, Ind.

ROY E. WRIGHT is director of gas and electric sales for the NEGEA Service Corp., and FREDERICK A. SCHLOMAN is assistant director. Mr. Wright joined the New England Gas & Electric System in 1930 as supervisor of house-heating and commercial sales. In 1936 he was named director of all gas sales for the system.

JOHN Q. WOODRUFF has been named manufacturers' agent for John Wood Co. He will handle John Wood automatic water heaters and Fluid Heat heating equipment for the heater and tank division in Utah, Montana, Nevada, Idaho and western Wyoming.

ROBERT W. BALL has joined Tidewater Gas Co., Wilmington, N. C., as heating and industrial consultant. The new position has been created to furnish prospective large customer accounts with studies and technical information on conversion to natural gas.

JOHN F. MCGUCKIN has been appointed gas sales manager of the Philadelphia (Pa.) Gas Works, division of United Gas Improvement Co. Mr. McGuckin was formerly manager of the gas house-heating division.

In recent appointments in the mining division, Mine Safety Appliances Co., Pittsburgh, named E. M. WHITE sales manager and W. C. HAMILTON mining operations manager.

WILLIAM L. HOWLAND has been elected to the board of directors of Portsmouth (Ohio) Gas Co. Mr. Howland is a partner in the law firm of Bannon, Howland and McCurdy and has been general counsel to Portsmouth Gas for some 10 years.

The A. V. Smith Engineering Co., Narberth, Pa., has elected JOHN WAGNER JR. to vice president. In this capacity, Mr. Wagner will direct field corrosion studies and research work.

L. SANFORD REIS has been elected to the board of directors of Portland (Ore.) Gas & Coke Co. Mr. Reis is president of the financial

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

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W. C. Washburn, Jr.
Equitable Gas

Edwin Ferguson
Equitable Gas

consulting firm of Reis & Chandler Inc., New York, and is president of Great Northern Gas Utilities Ltd., Edmonton, Alta.

GORDON O. HERAULD, southern division general superintendent of Washington Natural Gas Co., has joined the gas department of Stone & Webster Service Corp., New York.

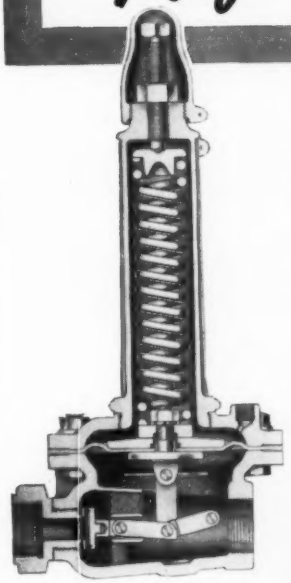
ALAN R. BAILEY, senior vice president of Southern Counties Gas Co., Los Angeles, has been elected to the board of directors of the company. He joined SoCounties last year. Prior to that, Mr. Bailey was assistant to the president of Pacific Gas & Electric Co., San Francisco, and vice president in charge of operations of Coast Counties Gas & Electric.

ARTHUR R. GOODMAN has been named superintendent of communications for Ohio Fuel Gas Co., Columbus. Mr. Goodman, assistant superintendent for the past two years, succeeds the late J. C. Williams. Ohio Fuel also has named ROBERT C. STEWART manager of distribution plant operations and ELDEN H. DAVIS manager of customer service operations.

Two promotions have been announced by Equitable Gas Co., Pittsburgh. WILLIAM C. WASHBURN JR. is now assistant general superintendent of distribution. Credit manager until his promotion, Mr. Washburn will be responsible for all customer service functions. EDWIN J. FERGUSON is manager of the newly formed commercial department. Until assuming his new post, he was assistant general superintendent of distribution.

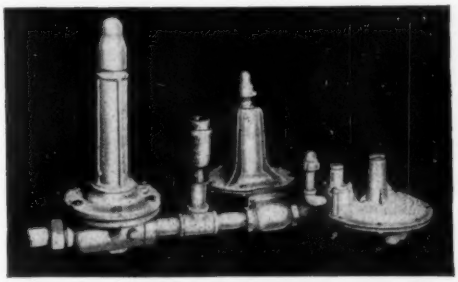
GEORGE W. KELSEY, vice president of B-I-F Industries Inc. and president of its Builders-Providence division, served as general

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN *Reynolds...*



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



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REEVES BROTHERS INC.
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people • *Continued*

chairman for the National Resources Conference held in Providence, R. I., recently.

Maxitrol Co., Detroit, has appointed JAMES L. POTTER as a representative in the eastern part of the country. In his new position, Mr. Potter will cover a territory composed of New England, New York, Pennsylvania, New Jersey, Maryland, Delaware, and Washington, D. C.

LEE A. MOULTON has been appointed training group supervisor for the ElectroData division of Burroughs Corp., Pasadena, Calif.

Several changes have been made in United States Pipe & Foundry Co.'s sales department. GEORGE J. BOGS, formerly Los Angeles sales agent, is now assistant Pacific Coast sales manager. He will still headquarter in Los Angeles. BARTLETT G. BRETZ, currently Kansas City sales agent, is now assistant western sales manager, with headquarters in the Chicago office. BUDDY P. AMIS, currently in charge of the Houston office, will become Kansas City sales agent, and HOYT N. BURNS, formerly in the Birmingham office, will be sales agent at Houston.

M. P. YOUKER, for the past 10 years head of Oronite Chemical Co.'s technical service, has been named assistant manager, western export department.

Carleton Brown
SoCounties

Kenneth Manner
Cities Service

WILLARD L. UMSTADTER has been named Atlas Valve Co.'s sales representative for the southern New Jersey territory. He will headquarter in Point Pleasant, N. J.

CARLETON E. BROWN is handling market research and development for Southern Counties Gas Co. He succeeds ROBERT M. MCINTYRE, who recently became sales manager of the SoCounties Orange county division. Until his new assignment, Mr. Brown was a sales engineer in the sales department.

KENNETH E. MANNER has been promoted to assistant secretary of Cities Service Gas Co., Oklahoma City. Mr. Manner recently joined the company as an assistant to the secretary in the Oklahoma City office.

W. M. BURGE, former midwestern regional sales manager of Oronite Chemical Co., has become West Coast regional sales manager in San Francisco. H. B. POLLOCK succeeds him as midwestern manager in Chicago. T. M. WELTON, formerly Chicago sales manager and more recently Pacific Coast manager, moves to New York as

Three veteran members of the supervisory staff of MidSouth Gas Co., Little Rock, were elected to vice president status recently. They are (from left): Richard P. Hill, sales manager, who has also been named to the board of directors; F. P. Clark, who will continue as secretary-treasurer; and R. A. Bautts, who will continue as MidSouth's manager of operations.

eastern sales manager. Mr. Pollock has just celebrated 35 years of service in the field of gas odorants.

ALBERT W. SWAN has been appointed assistant to the field engineering manager of the Electro-Data division of Burroughs Corp., Pasadena, Calif. LELAND W. BROWN has been named field engineering training manager of the division.

ARTHUR D. BACHTEL has been named superintendent of the blooming and structural mills at Kaiser Steel Corp. in Fontana, Calif.

Bendix Radio Corp., Baltimore, Md., has named LUTHER H. HOOPES advertising manager for Bendix two-way mobile and railroad communication products at the Bendix radio division. The company has named JOSEPH SCHREIBER southeastern sales manager for sales and service of two-way communication equipment.

S. G. PADDOCK has been named executive vice president of Burgess-Manning Co., Libertyville, Ill. He formerly served as vice president in charge of the industrial silencer division. Other newly elected officers are F. P. HUTCHINSON, director; E. D. WOISARD, treasurer and assistant secretary, and A. W. DREFFEIN, secretary.

Deaths

CLIFFORD E. BROCK, former vice president and director of the Kansas Power & Light Co., died recently in Salina, Kan. In 1939 Mr Brock was named vice president of Kansas Power with supervision of gas and electric properties. He was to have retired in July 1958.

WALDEMAR H. CHRISTENSEN, regional sales manager for the home products division of Minneapolis-Honeywell Regulator Co., died in Phoenix recently. At the time of his death, Mr. Christensen was in charge of sales for Honeywell home products in the Los Angeles, north coast, and mountain regions.

IRVING W. REYNOLDS, 77, vice president of the Foxboro (Mass.) Co., died recently of a heart attack. Mr. Reynolds joined Foxboro in 1908, the year the company was founded. He specialized in the production of precision instruments and, as factory manager, perfected techniques of manufacturing the process instrumentation pioneered and developed by Foxboro.

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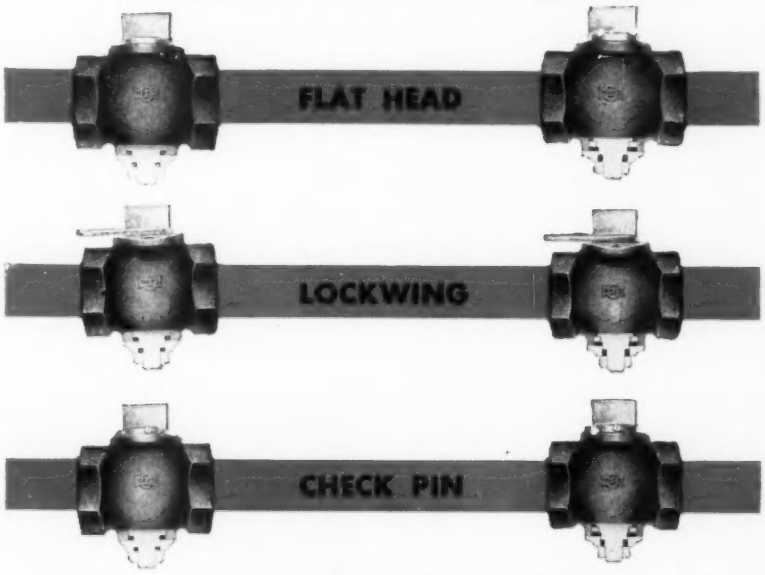

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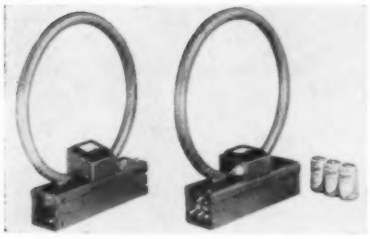
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 103, 104



1. Pipe detector

Transistors and printed circuits have been used by Oltron to produce rugged, compact, low-current-drain instruments for detecting and tracing buried pipes, valves or other metallic objects.

The extremely low current drain of transistors makes extended operation possible using only three standard-type flashlight cells as the entire power source. The received signal is audible in earphones, is also presented visually on a panel instrument. A marker signal may also be switched in as an aid to signal identification.

Transmitter and receiver units and their associated batteries are each contained in a small, sturdy metal container designed as an integral part of the electrostatically shielded pickup loops.
Oltron

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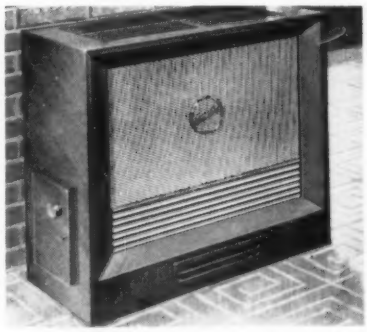
2. Dual-purpose filter

Small quantities of true vapor as well as liquids can be removed from compressed gases with Dollinger's new dual-functioning filter. The Du-Phase also removes contaminating vapors from gases which might be injurious to final products.

Du-Phase filter uses absorption and adsorption principles. The compressed gas or air being filtered first travels through a conventional set of absorption pads. Then, before leaving the filter housing, it rises through a metal canister or cartridge containing an adsorbent such as activated carbon or silica gel.
Dollinger Corp.



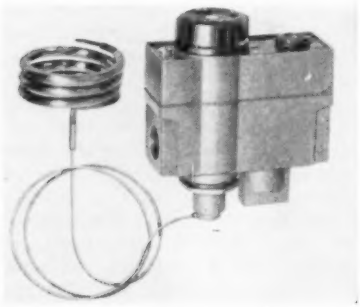
3. Vented room heater

Empire Stove Co. uses its Triple-Therm heat feature in its new Imperial vented room heater to eliminate drafty floors and give greater warmth these three important ways: gravity heat, permitting warm air to flow into the room through special louver openings at the top; radiant heat, flooding the living area with warmth from the entire front of the Imperial; and counter flow heat, delivering warm air at the floor level where a quiet-operating blower carries the heat across the floor to every corner of the room.
Empire Stove Co.

4. Water heater

Bryant's new Crystalglas water heater series is designed to accommodate all modern laundry equipment plus all other home sanitary requirements. The 30-gal. size has a 42,000-Btu/hr input, considered to be one of the highest heating inputs for a water heater of that size.

Recovery capacities for a 60° rise are 58.8 gal./hr; for a 100° rise, the recovery rate is 35.5 gal./hr. Construction features include Bryant's "saddle-top" design, which eliminates any chance of air pockets in the head.
Bryant Manufacturing Co.



5. Heater control

Designed specifically for the small space heater market, General Controls' new G-20 series controls are self-contained with matching dimensions and mounting requirements.

They permit interchangeability without altering original connections. Manufacturer and serviceman alike can offer complete choice of control functions desired from four models available. These

range from the deluxe G-24 with combination modulating and snap, hi-lo-off-type thermostat and General Controls' exclusive Hi-Fire ignition to the G-21 economy model with manual gas cock and hi-lo-off burner control.
General Controls Co.

6. Specially equipped Jeep

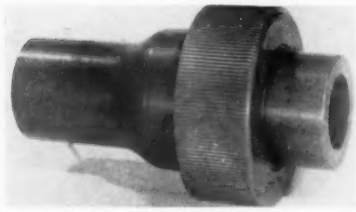
The new "Forward Control Jeep FC-150" may be equipped with a service truck body or dump truck body as well as with the conventional pick-up or platform stake bodies.

Both special bodies have been approved by the Product Engineering Department of Willys Motors. Winches, snowplows, angledozers, and towing equipment for use on the FC-150 are also available.
Willys Motors Inc.

7. Storage booster

A new Jetglas-lined storage booster has been announced by Day & Night. The AGA-approved, gas-fired unit features an input of 220,000 Btu/hr on the 100-gal. size, reportedly the highest input manufactured.

The 100JSB features a reheat of 184.8 gal./hr on a 100° rise and is approved for use with 180° water. A 360° traverse turret with side vent provides for either horizontal or vertical venting, easing many difficult installation problems.
Day & Night Manufacturing Co.



8. Lift check valve

Tube Turns Plastics has designed an all-polyvinyl chloride lift check valve for piping engineers in the petroleum and chemical fields.

The lift check valve will operate in either a vertical or horizontal position, and open and close under less than 6 lb pressure. A full 100 per cent flow area is provided. The valve's only moving part is a self-energizing disc.

The PVC pipe union principle has been incorporated. This arrangement permits the valve to be easily and quickly removed from the line for cleaning and servicing, when required.
Tube Turns Plastics Inc.

9. Thermometer series

In Wheelco Instruments' new thermometer series are recorders, record-controllers, indicators, and indicator-controllers.

The Wheelco 4000 series use large 12-in., easy-to-read charts. Uniform accuracy over the entire scale is assured by the use of mercury-actuated sensing elements. Finely built Bourdon coils, friction-free pen arms, and Invar metallic compensation for the instrument cases contribute to the smooth operation and dependable performance of the thermometers.
Wheelco Instruments Division

10. Gas detector

Pin-pointing leaks in buried pipelines is the function of a new portable gas detector from Johnson-Williams. The detector, which measures natural gas concentrations from 0 up to 100 per cent, is also useful for testing manholes and valves boxes.

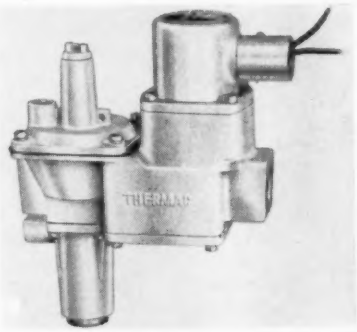
Two ranges are built into the instrument. In the low range of operation, the Gas-Pointer meter registers the lower explosive limit. If the gas concentration is found to be above this range, a 2-position valve can be turned to a 0-100 per cent range for direct reading of gas concentration on a second meter scale.
Johnson-Williams Ltd.

11. Hot water system

A pre-engineered supply system, which it is claimed can provide as much hot water as may be needed during rush hours without incurring excessive fuel costs at other times, is in production by Laars Engineers.

The unit has been developed to meet the most exacting requirements of restaurants, apartment houses, motels, schools, industrial plants, etc.

An outstanding feature of the packaged hot water system is a new type storage tank which can deliver more than 85 per cent of its hot water contents without a drop in outlet temperature.
Laars Engineers



12. Combination gas control

The new Thermac SLS 100 is a safety regulator with flow interrupter in combination with a quiet automatic main gas valve. The combination all-in-one control is designed particularly for forced air furnaces.

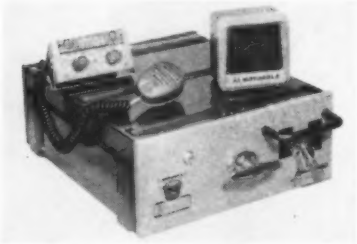
Thermac reports that the controls are field proven as individual regulators, safety and automatic main gas control units. They have been designed with ease of field servicing in mind. By removing four screws each component may be disassembled for inspection without removal from the line.
Thermac Co.

13. Inshot gas burner

Nu-Way Corp. is producing a new power inshot gas burner with an input range of 80,000 to 200,000 Btu/hr.

A new aid to servicing is the "panel construction." All operating parts and complete factory wiring are collecting on one mounting panel. The panel is easy to take out. Panel construction also has the function of shielding all working parts and wiring from heat.

In this new system, it's not only possible to control the volume of primary air furnished, but the primary air control actually proportions the total air volume into primary and secondary air.
Nu-Way Corp.



14. Private line radio

Companies eligible to operate two-way radio in the 450-470 mc frequency band can now install radio equipment that literally "shuts out" communications from other users operating on the same channel.

Motorola's new Private Line radio transmits a continuous, subaudible tone along with every voice transmission. Receivers open up for listening only when the proper tone is transmitted, so that reception can be cut out except when transmissions are being originated by the dispatcher or other mobiles operating in the same system. Because the operator hears only messages transmitted by radios in his system, operator fatigue is eliminated and the chance of missing or misunderstanding messages is minimized by Private Line radio.
Motorola Inc.

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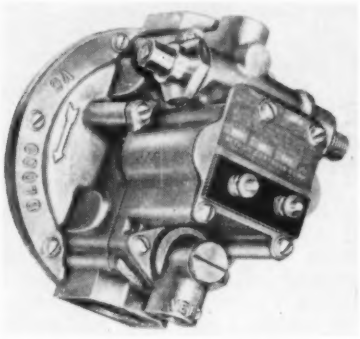
15. Instrument valves

Welding advantages of carbon steel and seat wear characteristics at least equal to stainless steel are combined in a new line of high temperature instrument valves from Edward Valves Inc.

Wearing qualities are improved by incorporation of an integral seat insert of chrome-cobalt-tungsten alloy (arrow). As the body of the valve is carbon steel, it can be welded into carbon steel pipelines with ease and efficiency.

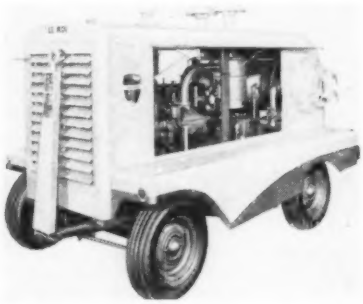
Rated at 250 lb at 850°F, the new valves have drop forged steel bodies and yokes and swing-bolted glands for easy repacking.
Edward Valves Inc.



16. Combination gas valve

A combination unit has been designed by Detroit Controls that incorporates a gas valve, pressure regulator and safety pilot in a compact, completely integrated unit.

The V-600 provides the benefits of simple installation, dependability, and economy. It features safe lighting, 100 per cent safety pilot shutoff, and may be used with all gases. The V-600 is a large-capacity unit capable of handling up to 300,000 Btu/hr.
Detroit Controls Corp.



17. Air compressor

Le Roi division is producing a new light, short-turning 600-cfm rotary air compressor, the first of a new line.

It is a portable, two-stage, sliding vane type rotary air compressor rated at a free air capacity of 600 cfm. Dry weight is but 7730 lb. It has a turning radius of only 11 ft 11 in.

The compressor is coupled to a GM-71 diesel engine with a hydraulically activated clutch. By use of an automatic variable capacity regulator and an automatic governor speed control, engine speed varies to match air demands.
Le Roi Division

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18. Silent gas control

A new self-contained, silent gas control for wall heaters, clothes dryers, space and unit heaters has been developed by A-P Controls. One of a complete line of gas controls, Model 5010 features silent operation, 100 per cent safe lighting and shutoff.

Model 5010 is a completely integral unit doing the work of five individual controls. Among its features is the large capacity built-in pilot filter which removes impurities to reduce pilot outages. It is available with a built-in pressure regulator for all gases, or without for LPG. It has a wide range of inlet and outlet sizes with side, bottom, or straight-through outlets optional.
A-P Controls

TRADE LITERATURE

19. Pipeline valve booklet

Pipeline gate valves for 6- to 36-in. lines are illustrated and described in a new 12-page bulletin from Grove Valve. The booklet has been prepared as an engineering and specification reference. Grove's Seal-O-Ring gate valves are of the round-opening through-conduit type. They feature a parallel-sided sliding gate with a combination of metal-to-metal and "O" ring seals on both sides, requiring no lubricant or sealing compounds.
Grove Valve & Regulator Co.

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20. Trencher bulletin

The Everett trencher, engineered and designed for the new Ford and Ferguson tractors, cuts clean straight trenches up to 42 in. deep, 12 in. to 18 in. in width. Complete descriptions of both the Model S series Everett trencher and Model 60 Everett trencher are available from the company.
Earth Equipment Corp.

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21. Power-operator catalog

Westinghouse Air Brake operators for actuating Rockwell-Nordstrom screwed-gland type, wrench-operated valves are discussed in a new four-page bulletin (V-604) from Rockwell. Size, cyl-

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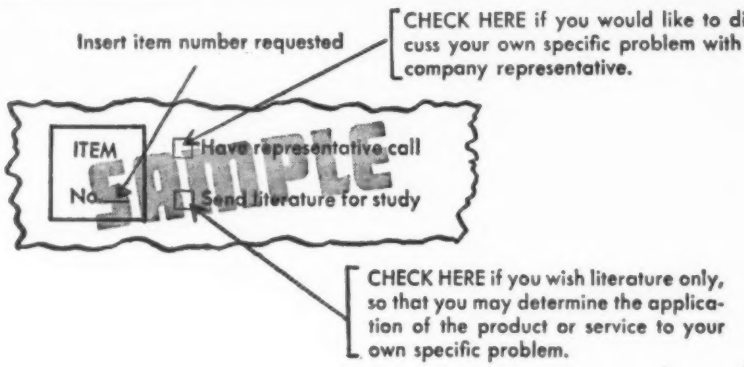
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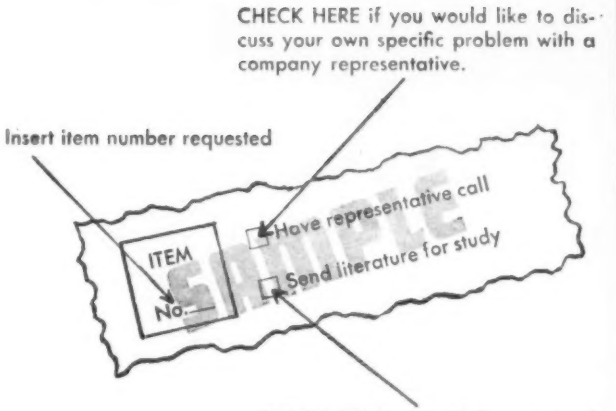
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inder diameter, cylinder stroke and list price are included in a listing of operating conditions. The easily mounted operators can be operated with gas, oil, water, or air at pressures up to 200 psi.
Rockwell Manufacturing Co.

---

22. Gas Chemistry bulletin

Modern gas chemistry and its ability to upgrade and protect metals in quality heat treating is the subject of a new 8-page bulletin. Surface Combustion describes the principal factors in atmosphere heat treating — the furnace, the gas generator, and the controller. A chapter is devoted to carbon control, showing installation pictures and a chart for the use of generated gas atmospheres.
Surface Combustion Corp.

---

23. Pneumatic control theory

Ten pages of a new bulletin (A130) on pneumatic control instruments are devoted to a discussion of general automatic control theory. The 44-page, two-color bulletin from Bristol describes in simplified terms and illustrations the basic concepts of narrow band, proportional, reset, derivative, and reset plus derivative control actions. Also covered are selective control, cascade control, and ratio control.
Bristol Co.

---

24. Data processing literature

Individual business applications of the Datatron electronic data processing system are featured in a new series of illustrated brochures from the ElectroData division. The brochures document specific Datatron solutions to computational problems in payroll processing, invoice billing, parts inventory controlling, accounts payable processing, utility billing, and life insurance recording.
ElectroData Division

---

25. Control literature

A new gas heating control (Model HC-E) designed for use on central heating furnaces with ratings up to 200,000 Btu/hr is the subject of a new bulletin from Robertshaw. The control combines a positive snap-action gas valve, a new-type valve actuator, automatic pilot and built-in pilot filter.
Robertshaw-Fulton Controls Co.

---

26. Valve folder

Crane Co.'s new folder describes brass composition-disc globe, angle, and lift check valves. The folder emphasizes the advantages of the composition disc brass valve for a broad range of services. The illustrated folder also shows major design features and gives complete sizes and dimensions.
Crane Co.

---

27. Process control bulletin

A new bulletin from CDC Control Services describes a major development in the process control field—dynamic control systems. The systems—called CompuDyne control systems—employ computer techniques and circuitry to accomplish dynamic control. Although the bulletin's main emphasis is on aeronautical testing, the application information and diagrammatic illustrations indicate how transients may be controlled in industrial processing generally.
CDC Control Services Inc.

---

28. Supervisory control report

The centralized, economical control of widespread, remote operations as accomplished by the Synchro-Scan supervisory control system is described in a new 12-page color bulletin. The system was developed by Builders-Providence Inc., a division of B-I-F Industries. It remotely controls the operation of any combination of pumps, valves, gates, generators, circuit breakers, and similar devices.
Builders-Providence Inc.

---

29. Rotameter bulletin

Brooks Rotameter has used a novel and convenient means for aiding in the selection of the appropriate meter for a specific application. A die-cut disc, eyeletted on the inside cover of the bulletin, serves to indicate the pressure and temperature limitations of Brooks rotameters as well as their flow capacity ranges. The indicated meter in turn is tied into brief description given on an opposite page with reference to further detailed literature.
Brooks Rotameter Co.

---

30. Noise bulletin

Industrial noise, its effects and recommended cures, plus a new approach to solving the hearing-loss problem, are evaluated in an illustrated book. Published by Sigma Engineering Co., the booklet is entitled "Why Must This Be?"
Sigma Engineering Co.

---

31. Safety check list

To locate the hidden probabilities of electrically ignited explosions in plants, a "Hazard Finder" has been published by Crouse-Hinds. The eight-page, illustrated folder contains a check list of 13 questions that can help determine whether uncontrolled flammable gases, vapors, dusts, liquids and other combustible materials are making a plant unsafe.
Crouse-Hinds Co.

---

32. Computer report

A four-page illustrated report from Bendix shows how a Bendix G-15 general purpose computer has been integrated into a customer-engineering-manufacturing system. According to the illustrated report, calculations and layout work required in design and detailing were greatly simplified.
Bendix Computer Division

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33. Valve literature

A catalog sheet from Atlas Valve describes the company's #1605 spring-loaded dual-purpose relief and back pressure valve, designed to function on both condensing and non-condensing systems. The two-color sheet contains photographs, cutaway diagram, design features, valve dimensions and list of materials.
Atlas Valve Co.

---

34. Pusher furnace bulletin

Standard, controlled, atmosphere and multi-zone pusher furnaces for carburizing, carbo-nitriding, and general heat treating applications are described in a new bulletin from Ipsen Industries. In addition to detailed descriptions, the bulletins present drawings and specification tables.
Ipsen Industries Inc.

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YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

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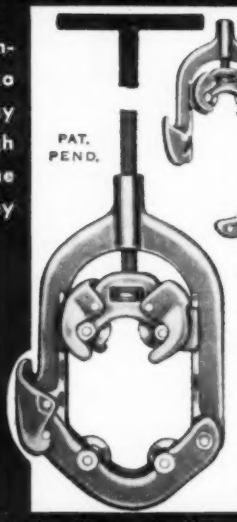

Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

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FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS.

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GAS calendar

September

3-5. Pacific Coast Gas Association Annual Convention—San Francisco.

6. New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

9-10. INGAA Annual Meeting—Shamrock Hilton Hotel, Houston, Texas.

9-13. AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

10. New England Gas Association Safety Conference—Sheraton-Plaza, Boston.

10-12. Mid West Gas Association Gas School and Conference—Iowa State College, Ames.

11-13. National Petroleum Association 55th Annual Meeting—Traymore Hotel, Atlantic City.

12. NEGA Residential Sales Division—Boston Gas Co., Boston.

13-14. Maryland Utilities Association 33rd Annual Fall Conference—Cavalier Hotel, Virginia Beach, Va.

16-18. AGA 9th Annual Accident Prevention Conference—St. Louis, Mo.

18-20. Southeastern Gas Association Convention—Robert E. Lee Hotel, Winston Salem, N. C.

20. Oklahoma Utilities Association Gas Division Conference—Skirvin Hotel, Oklahoma City.

20. AGA Great Lakes Public Relations Workshop—Hotel Statler, Detroit.

23-25. American Society of Mechanical Engineers—Statler Hotel, Hartford, Conn.

27. NEGA C-H-I Division—Wachusett Country Club, West Boylston, Mass.

October

1-2. Texas Mid-Continent Oil & Gas Association 38th Annual Meeting—Texas Hotel, Fort Worth.

7-9. AGA Annual Convention—Kiel Auditorium, St. Louis, Mo.

10-11. California Natural Gasoline Association Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena.

16-18. Wisconsin Utilities Association Gas & Electric Operation and Sales Sections Convention—Schroeder Hotel, Milwaukee.

21-25. National Safety Council—Conrad Hilton Hotel, Chicago.

23. NEGA Accounting Division—Sheraton-Biltmore, Providence.

November

6. NEGA Operating Division—Hotel Statler, Hartford, Conn.

11-14. American Petroleum Institute—Conrad Hilton Hotel, Chicago.

13-15. ASA 8th National Conference on Standards and 39th Annual Meeting—San Francisco.

14-16. American Society of Refrigerating Engineers Semi-Annual Meeting—Shoreland Hotel, Chicago.

18-19. SGA Annual Advisory Council & Management Conference—Point Clear, Ala.

18-22. National Warm Air Heating & Air Conditioning Association—Hotel Morrison, Chicago.

December

1- 6 American Society of Mechanical Engineers Annual Meeting—Hotel Statler, New York.

1958

January

23. NEGA Operating Division—Hotel Statler, Boston.

March

17-21. National Association of Corrosion Engineers—San Francisco.

20-21. New England Gas Association Annual Meeting—Hotel Statler, Boston.

24-26. Mid-West Gas Association—Broadmoor Hotel, Colorado Springs.

31-April 2. GAMA Annual Meeting—The Greenbrier, White Sulphur Springs, W. Va.

31-April 2. AGA General Management Section Conference—Washington, D. C.

April

8-10. AGA Sales Conference on Industrial & Commercial Gas—Hotel Schroeder, Milwaukee.

14-16. National Conference of Electric & Gas Utility Accountants—Shamrock-Hilton Hotel, Houston.

28-30. Southern Gas Association Annual Convention—Dallas.

May

5- 9. AGA Distribution, Production, and Transmission Conference—Roosevelt and Commodore Hotels, New York.

19-21. AGA Mid-west Regional Gas Sales Conference—Edgewater Beach Hotel, Chicago.

22-24. Pennsylvania Gas Association Annual Meeting—Pocono Manor Inn, Pocono Manor, Pa.

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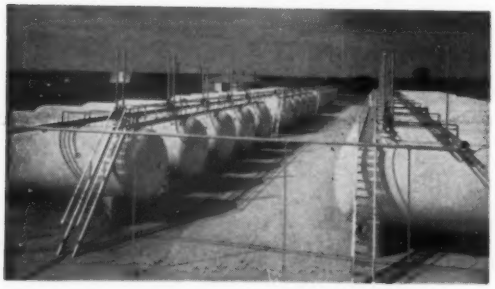

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Washington • *Cont'd.*

(from page 17)

They'll do this, according to present indication, by trying to force adoption of several crippling amendments when the Senate considers the measure. Chances to defeat the bill by direct opposition are figured to be virtually nil.

There are a long list of possible amendments, already beaten down for the most part in the House, which if adopted would make the bill "totally unacceptable" to producers. Opponents of the measure will try to swell their ranks by rounding up special interest groups who don't oppose the bill as such, but do favor some or all of these so-called crippling changes.

Top priority will probably go to efforts to secure the highly-controversial pair of amendments originally suggested by the Administration during hearings this year, but later withdrawn by President Eisenhower. One of these would remove from the bill a provision prohibiting the Federal Power Commission from considering costs in setting rates.

The bill's opponents favor an amendment to require costs, although the original Administration suggestion was only permissive.

The second amendment would require the FPC to review all definite price increases in existing natural gas contracts. Of the two amendments, this one has been called the most obnoxious to gas producers, although mandatory cost consideration is also violently opposed.

Opponents of the gas bill figure they've got a natural springboard for pushing these two amendments. They'll claim that the Administration believes they are necessary even though the White House later backed off.

There are also several other amendments to weaken the measure which the opponents will dredge up again next year. One, sponsored by the coal industry but similarly "suggested for consideration" by the Administration, would impose "end use" controls over natural gas. It would

establish federal price controls over interstate pipelines sales of gas directly to industrial consumers. Effect of this would be to prohibit so-called below cost sales.

Coal industry spokesmen claim the pipelines "dump" gas in the off seasons at less than actual costs in order to secure large industrial plants as customers and drive out competing fuels—coal and oil. This amendment was beaten back by a better than three-to-one vote of the House Commerce Committee this year.

Other amendments to weaken the Harris-O'Hara natural gas bill include an effort to stir up controversy over the states-right provisions, protecting the rights of the states to control minimum prices, and to tighten controls over all types of contract price increases.

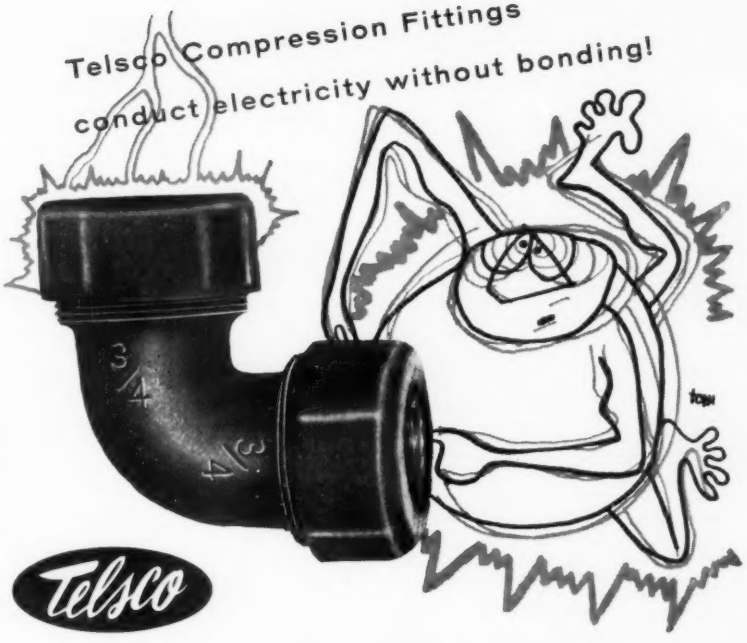
Another strategy opponents are reportedly considering is to try to encourage some proponents of the measure to press for their own amendments. This would mean that producer groups would be encouraged to try to secure amendments they favor, including changes to permit two-party favored nations escalation, shift the burden of proof in FPC hearings from the producer to the objector, allow cancellation of contracts because of federal control, and others.

Much of the distributor support for the current gas bill stems from its compromise nature, and some of these producer-supported amendments could remove that support, the opponents figure.

Efforts to kill the bill by damaging it for the supporters, or by trying to split the ranks of the supporters, probably won't be successful, most observers believe.

A strong effort will also be made in the Senate to substitute for the Harris-O'Hara bill a so-called compromise measure, backed by Sen. Kefauver (D.—Tenn.) last year. This bill would exempt from federal control all producers who sell annually less than 2 MMcf of gas in interstate commerce.

Backers of this bill claim this would remove from control the majority of producers, but retain strict controls over what they term the "monopoly on gas by the



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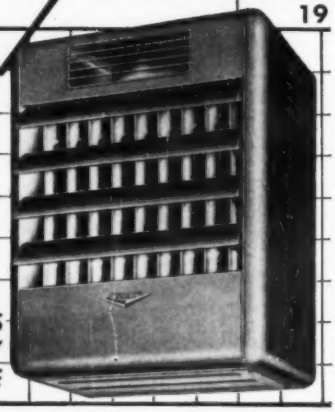

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Combustion chamber is made of ALUMINIZED steel that resists corrosion and greatly increases the life of the unit. A choice of fan or blower in all sizes from 50,000 B.T.U. to 200,000 B.T.U.

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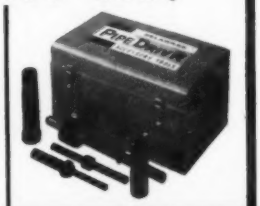
And much of the know-how is in using DELAWARE PIPEDRIVR tools. DELAWARE has engineered and field tested a complete set of accessory tools for every pipe driving operation. No more need to use costly makeshift tools. No threaded parts to jam, no pins to shear off . . . mill wrap is fully protected against stripping. Made from DELSTEEL ALLOY, the DELAWARE PIPEDRIVR tools are designed to take the toughest service. Big savings in time and cost are yours with dependable DELAWARE tools.



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few big firms which produce 85 per cent of all gas sold."

This attempt will probably fail.

"These tactics indicate the opponents are scared and grasping at straws," one gas industry spokesman comments.

The outlook, some five months before the next session of Congress gets down to business, is that the gas bill will pass next year. Supporters are a little edgy because 1958 is an election year. They are worried that the usual vote-getting maneuvering by lawmakers might cost them enough support so that the bill might either be killed or bottled up.

But most political observers believe that unless there is an unusual shortage of other campaign issues, the bill should have the support it needs. ■

corrosion • *Cont.*

(*from page* 39)

and "p" is the resistivity of the soil in ohm-centimeters. "Q" may be taken as

3 for bare lines,
30 for lines with poor coating (10 per cent bare),
300 for lines with good coating (1 per cent bare), and
3000 for lines with superior coating (0.1 per cent bare).

To illustrate the immense degree of variation in resistance to earth, consider two infinite lines; one a 25 lb/ft, 4-in. with superior coating, lying in 50,000 ohm-cm soil; the other a 200 lb/ft, 30-in. bare, in 500 ohm-cm soil. For the first line,

$r = 1/3940 \times 25 = 0.0000102$ ohms per foot

$k = 4.5/3000 \times 50{,}000 = 0.0000000067$ ohms per foot

$R = \sqrt{r/k} = 38.7$ ohms.

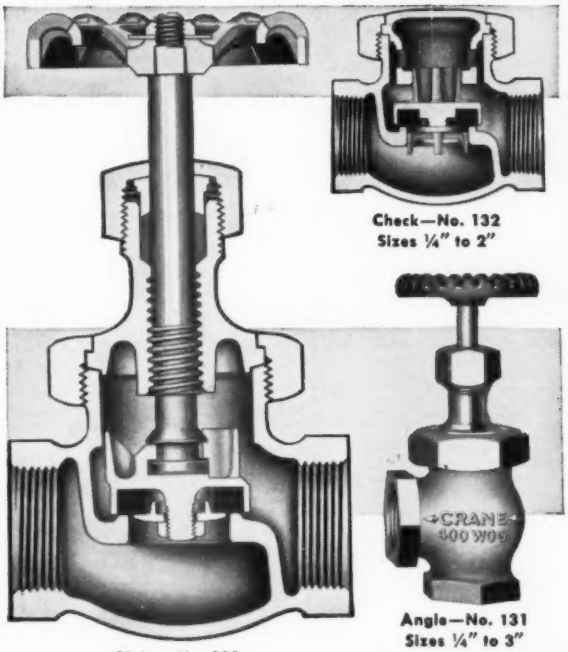
For the second,

$r = 1/3940 \times 200 = 0.0000013$ ohms per foot

$k = 30/3 \times 500 = 0.02$ ohms per foot

$R = \sqrt{r/k} = .008$ ohms.

The ratio is nearly 5000 to 1; and yet pipe is in service both larger and smaller than the range used, and soil is found with both higher and lower resistivities. It is perhaps not an exaggeration to say that a ratio of as high as 10,000 to one could be found. ■



Check—No. 132
Sizes ¼" to 2"

Angle—No. 131
Sizes ¼" to 3"

Globe—No. 130
Sizes ¼" to 3"

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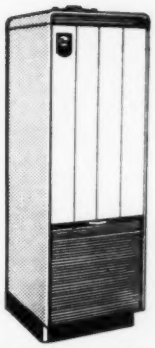

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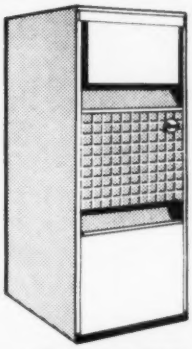
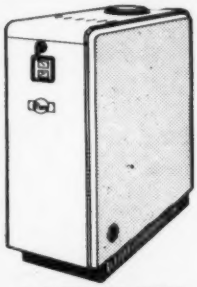


GAS AND OIL FIRED FURNACES

Illustrated above is the new Rheemglas Highboy gas furnace with glass lining for longer service. Handsome, colorful design. Many other models available. Sizes 25,000 to 300,000 BTU per hour.



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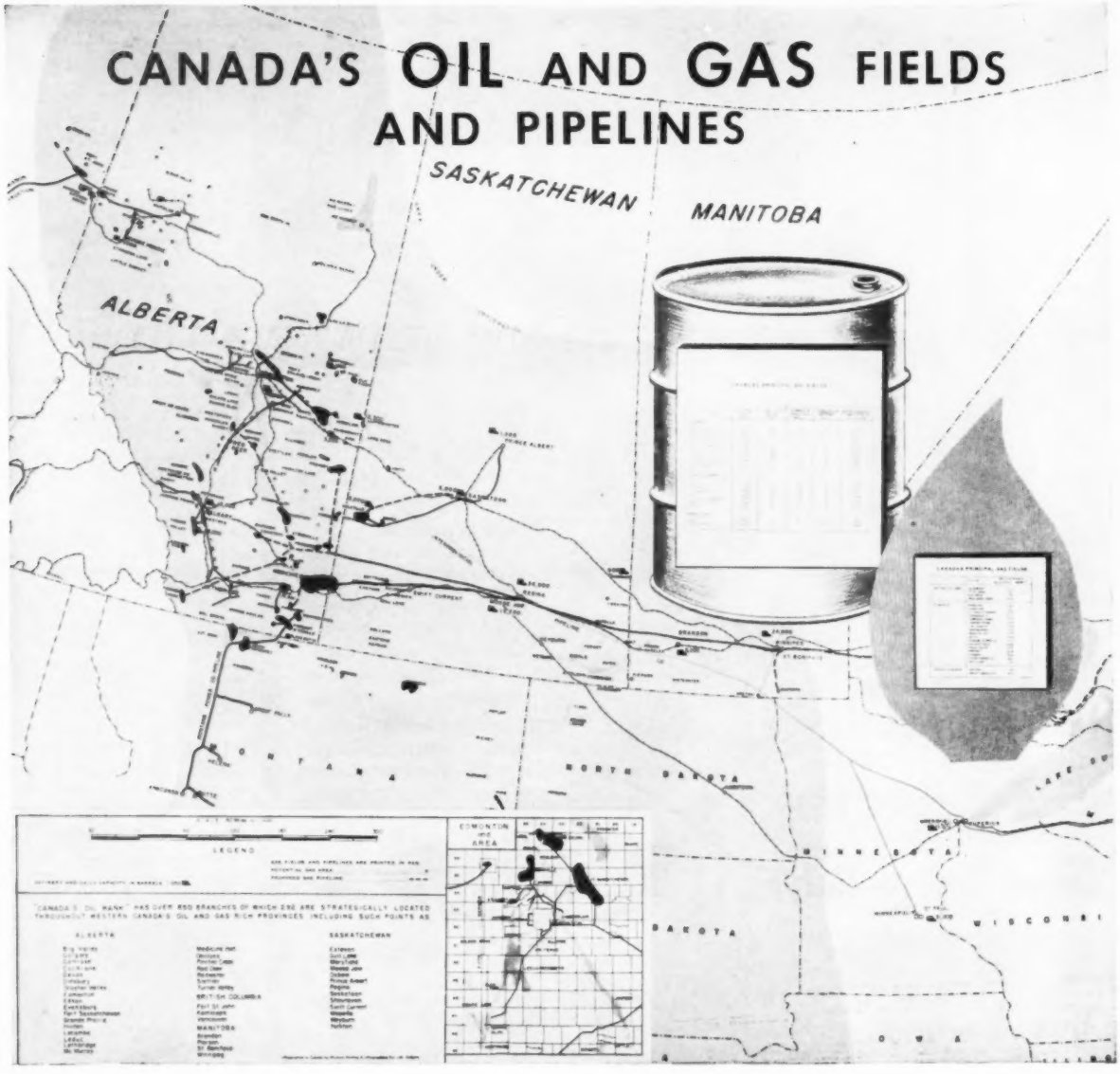

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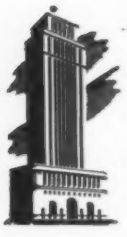
Prepared by the Oil and Gas Department of the "Royal"—Canada's "Oil Bank"—this new map measures 43" x 23". Scaled 60 miles to the inch and lithographed in three colors, it shows Canada's principal gas fields and potential gas areas; gas pipelines, present and projected; oil fields, oil pipelines, and potential oil areas, with tables listing the principal oil and gas fields and marketable reserves. For a copy of this free map and a list of the Royal Bank's current "Oil and Gas Bulletins" write to: The Royal Bank of Canada, Oil and Gas Department, 409 8th Avenue, West, Calgary, Alta., Canada. These "Oil and Gas Bulletins" are revised by the bank as necessary and cover statistics, regulations, tariffs, oil and gas financing and kindred subjects. They are up-to-date and of practical value to anyone seriously interested in Canada's oil and gas industry.



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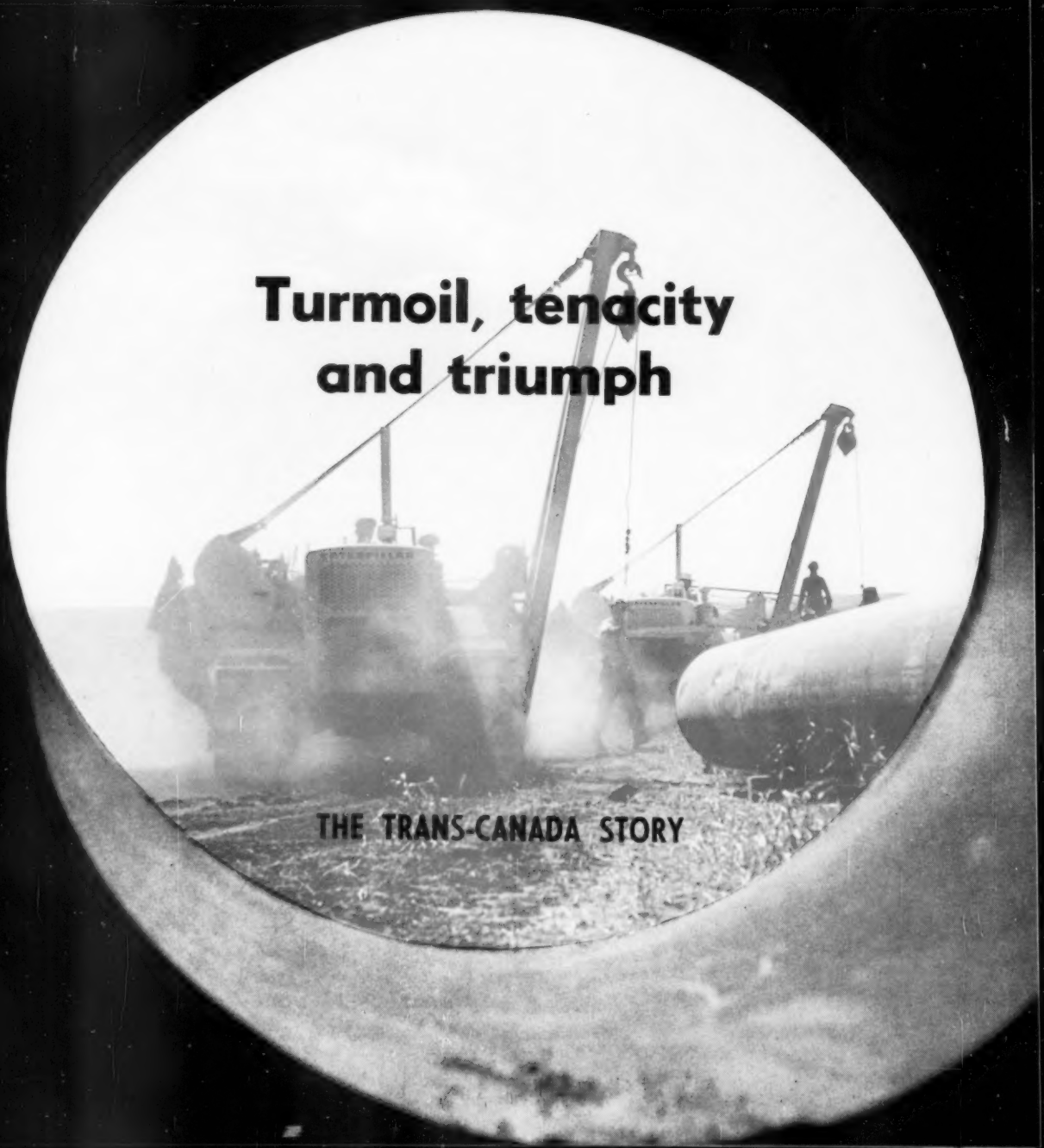
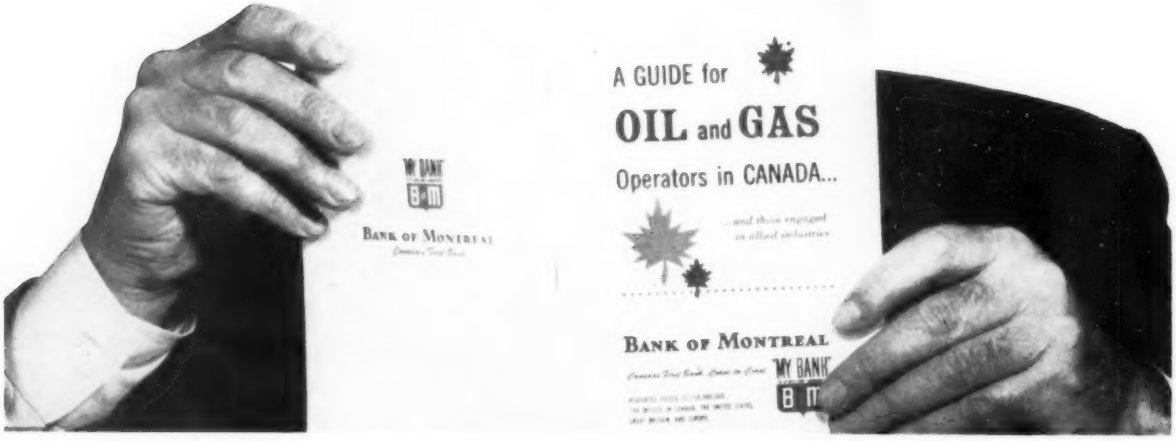


Turmoil, tenacity and triumph

THE TRANS-CANADA STORY



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Pioneering the project

Spread equipment being unloaded on the Manitoba prairies during 1957. Sight was not unfamiliar near Burstall in mid-1956.

THERE'S a pipeline abuilding in Canada. Simply, it will transport shut-in natural gas from relatively marketless western Canada to mushrooming markets in more industrialized eastern Canada. The project has confused the Canadians, awed people in the United States, and caused comment in Texas. Meanwhile, in Washington, D. C., plans are being presented and opposed concerning spillover of Canadian gas into gas-hungry central and eastern United States.

Trans-Canada Pipe Lines Ltd. (Toronto, Ont.) is the company with a plan that has become a reality as construction moves ahead on a long, long super- and big-inch pipeline from the Alberta-Saskatchewan border, across Canada, to an eastern terminal at Montreal, Quebec. The project has been up and down roller-coaster fashion for seven years that we know of. Now it is up and will reach unpredicted heights.

Natural gas discoveries were not new in Alberta in 1949. It has been known and used in the province for 75 years. The idea of exporting Alberta natural gas to the United States is also rather ancient. International export started in 1935 when a Canadian winked his eye at various boards, commissions and governments, and, with true pioneering spirit, piped Alberta natural gas across the border to furnish fuel to a couple of Montana oil wells on the pump. This trickle of gas across the International Boundary was certificated "by arrangement." In 1950, Alberta natural gas was exported under the Alberta-Montana border in earnest with a more rigorously documented permit.

However, in 1949, estimated gas reserves in Alberta were set at 4.26 trillion cu ft. The gas play had seriously interested oil companies. Wildcat holes were being drilled-in for crude oil. Results were making the ventures worthwhile. In fact, in the fall of 1949, tremendous oil strikes were overshadowing natural gas development in Alberta.

When an oil or gas strike is made anywhere in the world, it is not unusual for a Texan to have made it. Similarly, when a strike is made, feet start pawing around in the dust down in Texas. First thing you know, several Texans will be risking some venture capital in exploration and wildcat drilling.

The Alberta gas-oil activity stirred the interest of a pretty-tall Texan—Clint W. Murchison. Soon his Delhi Petroleums Ltd. had geophysical crews in the field and the company was studying the natural gas potential of the province.

The results were enough to gladden the heart of Mr. Murchison, who has been known to put together more than one fairly substantial

HISTORY

deal. It followed that Delhi Petroleums formed a new company—Canadian Delhi Oil Co.—for the purpose of doing something with the static natural gas resources in Alberta. Thus, the idea of a mighty trans-Canada natural gas pipeline was born.

Trans-Canada Pipe Lines Ltd. was chartered in 1951 under the sponsorship of Canadian Delhi. A special act of parliament of Canada was needed for the creation. The new company immediately asked the Petroleum and Natural Gas Conservation Board of Alberta for permit to export surplus natural gas from the province. The board said no.

About the same time, various other companies were formed and filed for permission to take Alberta natural gas to market outside the province. Notable among these was Western Pipe Lines, formed by a group of Canadian businessmen.

So the Canadian Delhi-Murchison interests were not the only ones with their eyes on Alberta gas. Between 1949 and 1954, a variety of proposals were heard. One company wanted to take Alberta gas east to Winnipeg and sell it to an American company for midwestern U. S. markets. A second proposition was to build a pipeline from Alberta to Montreal, swinging into the United States to pass south of the Great Lakes and back into Canada near Sarnia, Ont. A third idea was to exchange northern British Columbia-Alberta Peace River natural gas for markets in the U. S. Pacific Northwest, with Gulf Coast gas to be sent into Canada in the Niagara Falls-Toronto area. (The pins were pulled out from under the latter plan when Alberta dedicated its Peace River gas to Westcoast Transmission.)

These plans were sifted around for a spell. By 1953, only two companies were considered major contenders:

Western Pipe Lines—with plans to build a pipeline to Winnipeg; then drop a line to the International Boundary to make export sales to the United States; and build a line to eastern Canada later.

Trans-Canada Pipe Lines—with plans for an all-Canada route from Alberta to Montreal.

Western Pipe Lines' charter authorized it to take gas to the United States. Trans-Canada's charter did not provide for this export operation.

In early 1954, there were 13 trillion cu ft of natural gas reserves proved-up in Alberta. Reserves were being increased at the rate of a trillion cubic feet per year. So the time was ripe for some project to start down the long road to reality.

Government officials at the Federal and Provincial levels recommended that Canadian Delhi's subsidiary Trans-Canada Pipe Lines and Western Pipe Lines get together. Subsequently, the two firms merged and a new Trans-Canada Pipe Lines Ltd. emerged in the spring of 1954. An interim permit to export natural gas from Alberta to eastern Canadian markets was soon available from Federal and Provincial governments.

Trans-Canada Pipe Lines then ran headlong into trouble as it turned attention to financing. Many of the communities representing potential market for the pipeline were without gas distribution utilities. So who do you sell gas to? Existing utilities wanted to know exact prices for natural gas delivered to their take-points. Trans-Canada couldn't tell them in contractile terms what the price would be because it had to depend on Alberta Gas Trunk Line (gathering system owner and operator) to gather and transport the gas to Trans-Canada's western terminus. This gathering operation cost could not immediately be determined by Alberta Trunk Line.

To solve this problem, after considerable delay and much negotiating, Trans-Canada decided to purchase the gas directly from producers and pay for the movement of it through Alberta Trunk Line's gathering system. Soon, contracts with producers were signed for a total of 140 MMcf/day.

But Trans-Canada still needed a contracted market to show financial circles of both Canada and the United States. One big sales contract signed in 1954 was with Northern Natural Gas Co. (Omaha, Neb.). Trans-Canada agreed to sell Northern Natural 100 MMcf/day at Emerson, Man., beginning in the fall of 1955. The delivery volume was to increase to a minimum of 150 MMcf/day during the period of the contract. The Trans-Canada project failed to get off the ground in time for these commitments to be met, so that the contract is dead, according to Trans-Canada. Northern Natural is not at all sure that this contract is dead. (More of this later.)

Trans-Canada lined up other customers, but financial backing hinged on the company being able to start construction during the spring of 1955. More time passed by. Trans-Canada's backers were working away at it every minute. However, in January 1955, it was obvious that financing could not be accomplished in time to kick-off the project with the thaw-out of '55. Trans-Canada then turned to the government of Canada for a "deficiency" agreement. A deficiency agreement is a handy little thing that assures investors government security until a deal can be put in shape to provide the necessary security for its bonds. It is not a subsidy or handout. Trans-Canada officials were confident they could sign contracts with both producers and utilities as needed to make their plans economically feasible. They knew it would take time, however. So they asked the Canadian Government to secure the bonds during the interim.

The Canadian Government declined to do this in a form agreeable to Trans-Canada's sponsors, so Trans-Canada continued to forge ahead against what many thought

were insurmountable obstacles. More contracts were signed during 1955 as key Trans-Canada officials battered the project forward. Winnipeg & Central joined the parade as did Union Gas Co. of Canada. And many new gas supply contracts were signed with producers.

Then, interests from the United States and Canada including International Utilities Corp. (New York), and some of the sponsors of Trans-Canada arranged to purchase the publicly owned gas distribution system for Montreal operated by the Quebec Hydro-Electric Commission. Quebec Hydro's gas system was merged with Montreal Coke & Manufacturing Co. and other gas properties in the area. The result was Quebec Natural Gas Corp. and another firm contract for natural gas from the Trans-Canada pipeline. Screams were heard from French-Canadian leaders in the Province of Quebec, equal in intensity to those from a Canadian bull moose that has backed into a blow torch. However, the president of Quebec Natural and 12 of its directors are French-Canadians and this recognition has stilled these flames. This happened during April 1955.

Immediately after this, Tennessee Gas Transmission Co. (Houston) came into the picture with a proposition. An agreement was made with TGT for gas supply from the United States. TGT would deliver the gas to Trans-Canada for the Toronto-Montreal markets until western Canadian gas could be delivered through the Trans-Canada pipeline system. This deal became part of a later proposal under which an international gas exchange system was suggested. The exchange would have Tennessee Gas buying Canadian gas from Trans-Canada at Emerson, Mant., and selling U. S. gas to Trans-Canada at the Niagara-Queenston area. Purpose of this move in May 1955 was to open the way for Trans-Canada to start construction while continuing efforts to firm-up gas purchase and sales contracts that would permit financing.

According to Trans-Canada, the contract with Northern Natural expired in April 1955. As mentioned, this does not exactly parallel the views of Northern Natural. In any case, after the alleged expiration of the Northern Natural commitment, Trans-Canada Pipe Lines contracted to sell 200 MMcf/day of Alberta natural gas to Tennessee Gas Transmission at the International Boundary near Emerson. An option to sell TGT an additional 200 MMcf/day, when and if available, was part of the agreement.

During these times, much talk was heard concerning the difficulty of constructing any kind of pipeline across the massive rock folds of the Canadian Shield—north of Lake Superior from the Manitoba-Ontario border to Kapuskasing, Ont. It did look like financing of this costly stretch through the comparatively thin market area would be quite a hill for the project. So Trans-Canada told the government further delay was inevitable.

Both the Canadian government and the Ontario government were, in fact, very anxious to have the pipeline built and had expressed this wish several times during 1955. Attention was turned to working out a plan to give the Trans-Canada project a boost across the Canadian Shield.

The solution seemed to be formation of a government corporation (Crown corporation in Canada) that would build the Canadian Shield section of the pipeline, lease it to Trans-Canada, taking the interests of both parties into consideration, and provide a method whereby Trans-Canada could acquire ownership of the Crown Corp. section when its operations put it into financial position to do this.

As will happen in North America, such matters creep into politics or the politicians creep into them. Some political passions were aroused during the discussions of government participation in bringing the Trans-Canada pipeline into reality. But early in 1956, measures to form the Crown Corp., and finance it, came before the Federal and Ontario houses. Certain political factions went through the ceiling. Other parties, able to understand what the pipeline could mean to Canada's life, backed the proposal just as strongly.

While the governments were kicking around these discussions, Trans-Canada braced itself to hurdle—or slip under — another barrier. To get construction rolling in the spring of 1956, the steel situation made it necessary to place orders for line pipe by November 1955. Again, Trans-Canada was stymied.

Saskatchewan's Great Sand Hills country was thought to be pretty rough for pipelining. Here, Majestic Contractors Limited rolls right through, in 1956, with very little difficulty.

Gardiner Symonds' Tennessee Gas Transmission Co. stepped into the picture again and underwrote the order for Trans-Canada Pipe Lines' pipe for the Alberta-Winnipeg section. TGT received an option to purchase shares of Trans-Canada stock. This option was quickly taken up and TGT became a full sponsor of the Trans-Canada project.

To revert back, Western Pipe Lines, which became a subsidiary of the "new" Trans-Canada Pipe Lines, had built a 76-mile, 20-in.

pipeline from the U. S.-Canadian border, near Niagara Falls, to near Toronto, Ont. This line was completed in October 1954. The line was leased to Niagara Gas Transmission (subsidiary of Consumers' Gas Co. of Toronto). Consumers' Gas purchased gas on the Louisiana-Texas Gulf Coast and arranged for TGT to transport the natural gas to the inlet of the Niagara Gas Transmission pipeline. Niagara moved the gas to Consumers' Gas. The latter company then started converting its Toronto distribution system to natural gas and development of expanded markets in preparation for the arrival of western Canadian natural gas via the Trans-Canada pipeline.

Then, in December 1955, Trans-Canada Pipe Lines signed a contract with Niagara Gas Transmission to use surplus capacity of the Western Pipe Lines-built Niagara-Falls-Toronto pipeline. Volumes so moved were to be used by Trans-Canada to supply its Toronto-Montreal mainline section until the mainline from Alberta could be built and tied-in. This would permit considerable market development in the Montreal area and along the mainline run. TGT agreed to supply about 86 MMcf/day of gas for this plan.

Still in December of 1955, things developed from hectic to more hectic for principals and backers of the Trans-Canada objectives. First, forward-thinking, aggressive Tennessee Gas Transmission Co. rocked more conservative elements of the North American gas industry by equating gas-short market areas with prolific Alberta gas reserves for a resultant proposal that may be the most important move ever made for mutual use of mutual energy resources on the North American continent. Thus, TGT's Midwestern Gas Transmission application was filed with FPC (see GAS, December 1955, p. 114).

And, during the same month consideration of the bills to establish the Crown Corp. (to build pipeline over the Canadian Shield) was started by the Canadian and Ontario governments. So we had a pretty hot hassle shaping up in Canada to match the red hot action that was developing simultaneously in the U. S. FPC.

It became evident in February 1956 that Trans-Canada Pipe Lines could use more financial and technical foundation. The base of the project was broadened when Canadian Delhi, Western Pipe Lines, and Tennessee Gas Transmission reduced their ownership to allow Canadian Gulf Oil Co. (now the British American Oil Co. Ltd.) and Hudson's Bay Oil Co. (affiliate of Continental Oil Co.) to participate in sponsorship of the Trans-Canada project. After the shuffle, ownership percentage stood at:

Canadian Delhi	24.5 per cent
Western Pipe Lines	24.5 " "
Tennessee Gas Transmission	17 " "
Canadian Gulf Oil	17 " "
Hudson's Bay Oil & Gas	17 " "

With these intrepid and well established backers in the deal, the Trans-Canada project was given new acceleration. It was made perfectly clear among the Trans-Canada group and to the Canadian people and governments that these holdings were for the financial development period only. Announcements are made that when Trans-Canada issues were placed before the public of the United States and Canada, not less than 51 per cent of the ownership of the firm would be available to Canadians.

Stable contracts with Alberta natural gas producers for the 4.35 trillion cu ft of gas Trans-Canada was authorized to remove from Alberta had been worked out by spring in 1956 and it now became obvious that the variety of opposition to TGT-Midwestern plans to take large volumes of gas from Trans-Canada for U. S. markets would necessitate long, drawn-out hearings before FPC. To complicate the situation, Trans-Canada was committed to take-up its option on 34-in. pipe for the Alberta-Winnipeg section of the pipeline by early June, but to do this it had to be financed.

The only avenue to timely financing was getting Canadian customers to increase their purchases. The contracts which had been signed at that time, and those which were then under negotiation, were not large enough to finance the pipeline on the basis of the Canadian market only.

Trans-Canada went back to its previously signed customers and asked them to re-survey their markets and make any realistic volume increases they could. This same thing was asked of the companies who then were negotiating their gas purchase contracts with the pipeline.

All companies cooperated, and when the new market studies were completed, substantial increases were made in the gas purchase contracts with Trans-Canada. These increases made the Trans-Canada pipeline a project that could be, and was, financed.

Next, in order to assure the start of construction, an agreement was proposed under which the Crown Corp. could loan Trans-Canada up to about $72 million. This was not a give-away. The money was to be repaid by April 2, 1957, at 5 per cent interest, or the Crown Corp. would fall heir to all of Trans-Canada's assets.

The loan touched off angry debate in Ottawa. Tory and C.C.F. (Socialists) raised cain over the loan of tax money to a "U.S.-controlled firm backed by U.S. gas and oil interests headed by Texas millionaire Clint Murchison." Both parties set out to filibuster the matter to death. Debate was limited and Parliament, under the leadership of the then Prime Minister St. Laurant (Liberal party), advanced the loan. Then, the bill approving formation of the Crown Corp. was passed in Ottawa in early June 1956. Trans-Canada, somewhat battered but more deter-

mined and on better footing than ever, immediately started construction.

Pipe started rolling into Burstall, Sask. and pipeliners were off to the races. However, it turned out to be an extremely short race. The U.S. steel industry's managements and labor unions had a slight parting of the ways. A steel strike was called and mills rolling Trans-Canada's 34-in. pipe shut down. Available pipe was rationed between two pipeline spreads — instead of the four spreads planned —which built 230 miles of line taking the pipeline from Burstall to Pense, Sask.

With gas purchase contracts, gas sales contracts, and with firm arrangements for the Crown Corp. to take the pipeline across the Canadian Shield under a lease-purchase clause, Trans-Canada officials were confident they could finance the project. During the fall of 1956, close liaison with financial houses in Canada and the United States was maintained. In February 1957, Trans-Canada Pipe Lines Limited announced its public offering. The offering was far-and-away oversubscribed.

Trans-Canada Pipe Lines and its underwriters held true to the agreement with the Canadian people and their governments. In short, the Canadians were given first crack at the offering. And they took a rather healthy crack at it. Previously outstanding shares of common are here and there, but there is no doubt but that Canadian ownership in these shares brought the total of Canadian-owned common stock to the required 51 per cent at the time public financing was initially completed. The interesting thing to watch here is where ownership will eventually wind up. Not much change in the ownership among the major Trans-Canada associates is expected, but the remaining shares (via "units") are changing hands like hot-cakes (see Financial section).

About $250 million (U.S. dollars) was raised from the Trans-Canada offering. Another $125 million will be used by the Crown Corp. to build the Canadian Shield section of the line—making cost of the total initial Trans-Canada system $375 million.

Meanwhile, back at the FPC, in November 1956, the commission virtually tore up a previously established policy against granting U.S. market to gas companies dependent entirely on foreign resources for gas supply. They permitted the Pacific Northwest pipeline case-established precedent to go by the boards by: (1) certificating importation of Canadian gas (from British Columbia-Alberta Peace River fields) into the *Scenic Inch* pipeline from Westcoast Transmission Co., and (2) certificating the importation of Mexican gas by Texas Eastern Transmission Corp., Shreveport. This seemed to add possibilities to the Midwestern plans for pumping Canadian gas across the International Boundary.

The very day FPC started hearings on the TGT-Midwestern case, another group of companies—The Peoples Gas Light & Coke Co., Chicago, and subsidiaries—filed to certificate a proposed project to bring more gas into the U.S. Midwest. And Northern Natural had filed for permission to bring Canadian gas into other parts of the midwestern U.S. long before Midwestern Gas Transmission filed. Still another interest, American Louisiana Pipe Line Co., Detroit, and affiliated Michigan-Wisconsin Pipe Line Co., was heard from in relation to bringing more gas to the Midwest. All of these plans and applications were more or less competitive — depending upon which side of the fence you happen to be on.

In any case, the Midwestern Gas Transmission application was deluged with intervenors, including many in addition to the important gas companies previously mentioned. FPC ruled that the intervenors opposing the TGT-Midwestern filing would have to bring their own proposals to serve the same relative market before the commission in a comparative-competitive hearing. This hearing cranked up in Washington on May 14, 1957, and seems destined to break records established in words-and-paper battles before FPC.

Trans-Canada Pipe Line struck a beautiful blow for its progress and esteem when it wiped out its indebtedness to the Canadian government (under the June 1956 Crown Corp. loan bill) on Feb. 26, 1957. The repayment broke down as: $49.75 million, the amount that was actually borrowed; $880,071 in interest; and $86,531 for government administrative costs in handling the loan—for a total of $50,716,603 (Canadian).

Crossing the Assiniboine River, near Portage la Prairie, Man., during wintry December days of 1956.

So, construction on Trans-Canada's pipeline is in full swing this summer. Markets are adequate and rapidly expanding beyond even the hopes of the past. Gas supply is assured and gas reserves in the producing fields of Alberta are increasing at an exhilarating pace. The biggest financial hurdles are behind. The projected sale of Canadian gas to TGT-Midwestern is still up in the air, but there are indications that a certificate will be available before the end of the year and construction of the Midwestern Gas Transmission pipeline would then begin in the spring of 1958.

Trans-Canada Pipe Lines' initial pipeline system is now an assured reality.

Natural gas supply and gathering system

GAS SUPPLY

NATURAL gas fields are spotted over much of Canada's geography. Most of them appear to be small in extent, which limits their value to large-scale transmission plans. British Columbia, Alberta, Saskatchewan and Ontario have fields that can be called "commercial."

British Columbia natural gas is essentially dedicated to Westcoast Transmission Co. Ltd. for transport to customers within the province and for export to the United States. Also, large volumes from Peace River and Savanna Creek fields in Alberta are contracted for, or are in the process of negotiation, to Westcoast.

Gas reserves in Ontario and Quebec are shoe-string plays relative to a project the size of Trans-Canada Pipe Lines. However, they are quite important to local markets and in the case of Ontario, at least, are commercial within the province. But they are definitely limited for long-term, high-volume exploitation.

Central and eastern Alberta contain the prolific natural gas reserves needed for sustained high-volume transmission and transmission system growth. The history of natural gas in the province covers a span of 75 years. Relatively limited volumes are used within the province and some exportation across the U.S.-Canadian border is certificated.

As old as the history of Alberta natural gas is, the really important extension of reservoirs did not occur until after 1948. Gas reserves for the province stood at 4.26 trillion cu ft that year, according to official estimates. But then exploration and development drilling, primarily for crude oil production, got into high gear. Important new gas discoveries were made in association with oil strikes.

First applications to export Alberta gas to eastern Canadian and U.S. markets were turned down in 1949 because of inadequate reserves—then 4.4 trillion cu ft.

Under intensified oil exploration work, natural gas reserves in Alberta increased to 4.7 trillion cu ft in 1950. By 1951, this figure was upped to 6.8 trillion; and again increased in 1952 to 11.5 trillion cu ft.

When Trans-Canada Pipe Lines was granted a permit (in 1954) to export natural gas from Alberta to potential markets in eastern Canada, the province's reserves were estimated at 13.4 trillion cu ft. The permit allowed up to 4.35 trillion cu ft to be transported out of the province.

But reserves continued to grow and new gas reserves are proven in Alberta almost daily at the present time. The 1955 reserves figure was set at 15.6 trillion cu ft. Gas reserves increased by 2.7 trillion cu ft during the single year 1956, to bring total provincial reserves to 18.3 trillion. The 4.35 trillion cu ft allotted Trans-Canada Pipe Lines for export are sufficient gas supply to service all of the 20-year gas sales contracts now signed.

It should be remembered that

Gas supply for Trans-Canada pipeline is provided by the gathering system of Alberta Trunk Line.

Alberta gas reserves have been developed almost entirely by the search for crude oil. There was only limited local drilling for natural gas until the Westcoast Transmission and Trans-Canada projects were put together and financed. Natural gas reserves are expected to increase even more rapidly in Canada due to these added incentives.

The "Gordon Commission Report" (Preliminary Report, Royal Commission on Canada's Economic Prospects, December 1956), states that:

"For (natural) gas, the potential output is estimated at 15 times the 1955 output and will be about 50 per cent more than expected domestic requirements in 1980. This means there will be large quantities of oil and gas available for export."

And, it is further stated that:

"By 1980 between two-thirds and three-quarters of a greatly increased total (of Canada's energy requirements) will be supplied by petroleum and natural gas; in both of these commodities Canada will, on balance, be more than self-sufficient."

As mentioned, Trans-Canada Pipe Lines has a permit to remove 4.35 trillion cu ft of natural gas from Alberta over a period of the next 25 years. This limits the maximum take to 620 MMcf/day and the annual take to 210 billion cu ft.

Proven Alberta reserves in the operating sphere of Alberta Trunk Lines' present gathering system total 7.3 trillion cu ft.

Trans-Canada Pipe Lines has 55 gas purchase agreements, covering 15 fields in Alberta and Saskatchewan at the time of this writing. These figures may well be revised upward at the time of reading. Major gas fields that will produce Trans-Canada's gas supply are shown in *Fig. 1*.

For Trans-Canada's recently completed financing, gas supplies were obtained at a central field price.

Recent gas purchase agreements to meet proposed new market expansion have been concluded with the central field price increased to 12 cents/Mcf for deliveries up to Dec. 31, 1959, in anticipation of increased revenues to be earned as a result of the additional volumes to be transported through the Trans-Canada system.

GATHERING SYSTEM

TRANS-CANADA has contracted its gas supply and reserves by purchase agreements with producers operating in the prolific natural gas fields of Alberta. The natural gas purchased by Trans-Canada will be moved from the fields to the western terminus of the big-inch pipeline by the Alberta Gas Trunk Line Co. Ltd. The latter company will own and operate its facilities as a gathering system for Trans-Canada.

Alberta Trunk Line was formed through a Special Act of the Legislative Assembly of the Province of Alberta. Trans-Canada signed its present transportation agreement with the gathering system company on Jan. 29, 1957. After the initial development period, Trans-Canada agreed to pay Alberta Trunk Line for gathering, transport, and delivery operations on a cost-of-service basis. This "rate" is computed from the following factors for a given period:

1. Alberta Trunk Line's operating expenses for the period.

2. Depreciation of the gathering company's physical plant at 4 per cent per year.

3. Income and taxes for the period.

4. Return of 7.5 per cent per year on the depreciated original cost of Alberta Trunk Lines facilities used in the gathering operation and on necessary working capital.

During the first four years of Alberta Trunk Lines operation, Trans-Canada will pay a flat rate of 4 cents/Mcf transported by the gathering system or certain minimum payments based on guaranteed minimum volumes of gas that may be transported by Alberta Trunk Line.

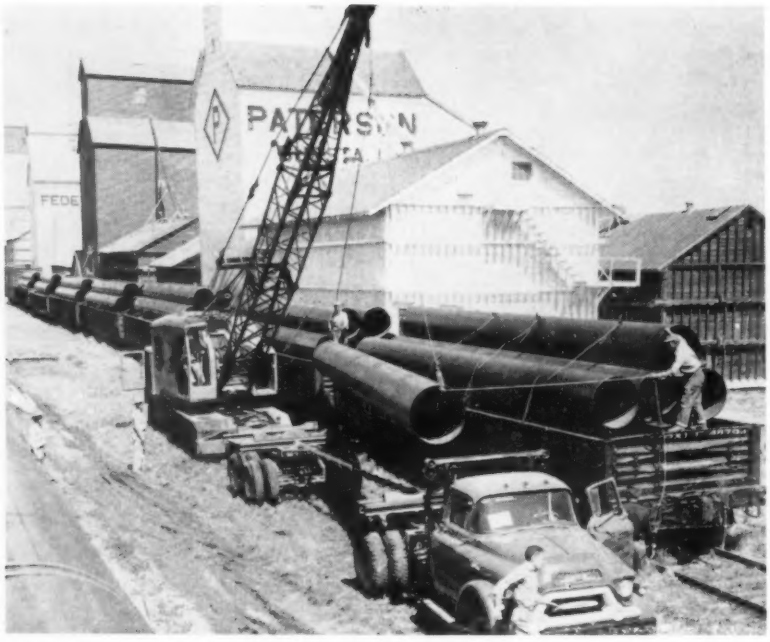
Construction of the Alberta Trunk Line facilities is scheduled to be spread over a four-year period. It will develop in direct relation to Trans-Canada's load expansion. The first phase of the gathering system's construction is underway. The initial program will connect the Provost and Bindloss fields with Trans-Canada's western terminal. About 100 miles of 18-in. line and 18 miles of 34-in. pipe will be in place and operational early this fall.

Some $13 million was financed early this year for this year's construction program and for design and installation of flow control, metering, pressure regulating, and other necessary equipment.

The full extent of the Alberta Gas Trunk Line gathering system, as currently planned, is shown on *Fig. 1* in the supply section. This will be its status at the end of the four-year development period. The project has been estimated to cost approximately $55 million.

The Alberta Gas Trunk Line Co. is a quasi-political amalgamation of producers, pipeliners and representatives of the Alberta Provincial government. Boiled down, it is a pipeline plum for the people of Alberta. Trans-Canada's permit to export natural gas from Alberta—Canadian gas per se—for Canadian consumption was conditioned with the provision that this gas could be delivered only through the lines of Alberta Trunk Line.

The gathering-system company's first public sale of stock was offered only in Alberta. Screams are still being heard on both sides of the International Boundary. The 2,552,300 Class A non-voting shares, priced at $5.25 each, were eagerly snapped up in the heaviest financial rush of the Province's history.



First shipment of 34-in. line pipe arrives at Burstall during 1956. Trans-Canada's pipeline was completed to near Regina that summer.

DESIGN

The slide rule phase

THE Trans-Canada pipeline will start out as a 34-in. OD system. There will be a 586-mile leg of the 34-in. pipe before dropping to 30-in. OD. The 30-in. segment will carry the gas 1251 miles and then the system reduces diameter again for a 308-mile run of 20-in. OD pipe. From this mainline a lateral consisting of 33 miles of 24-in. pipe will take off at the junction of the central and eastern section and a 40-mile lateral will be tapped-off near the eastern terminal.

When the full initial-pipeline system goes into operation—before Nov. 1, 1958—it will be powered by 27,700 compressor horsepower in four stations (plus a 5000-hp station in the Crown Corp. section) and will have delivery capacity of 300 MMcf/day. This will be expanded through the early years of operation to a designed maximum delivery capacity of 780 MMcf/day.

The pipeline and connected facilities have been designed with the American Standards Association B31.1.8-1955 Code for Pressure Piping, as the basic guide. Applicable codes of both countries have been used for basic design of facilities not covered by the ASA B31 code.

Designed maximum operating pressures will be 830 psig in the western (34-in. OD) section; 930 psig in the central (30-in. OD) section; and 800 psig in the eastern (20-in. OD) section.

System as installed during 1957 will be the 34-in. Alberta-Saskatchewan border to Winnipeg section, and 85 miles of Trans-Canada's 30-in. to the Manitoba-Ontario border. In addition, the Northern Ontario Pipe Line Crown Corp. will complete 315 miles of 30-in. from the Manitoba-Ontario border to Fort Williams-Port Arthur. Other construction will be completed in '57, but this is the extent of the pipeline that will be delivering Alberta natural gas.

No compressor horsepower will be built during 1957. Wellhead pressures from the Bindloss, Sibbald, and Provost fields will provide sufficient volume to supply natural gas to utilities that will be

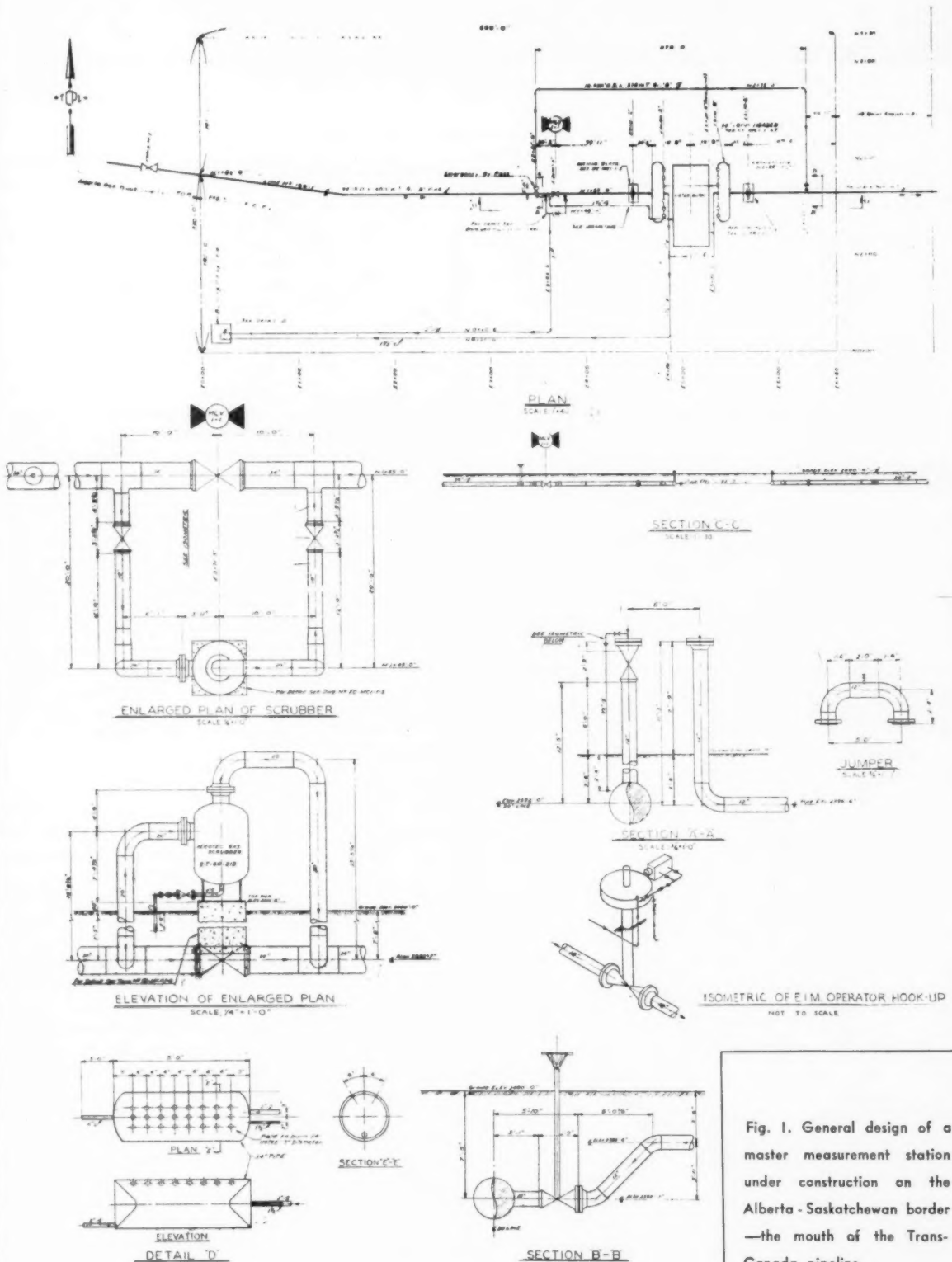


Fig. 1. General design of a master measurement station under construction on the Alberta - Saskatchewan border —the mouth of the Trans-Canada pipeline.

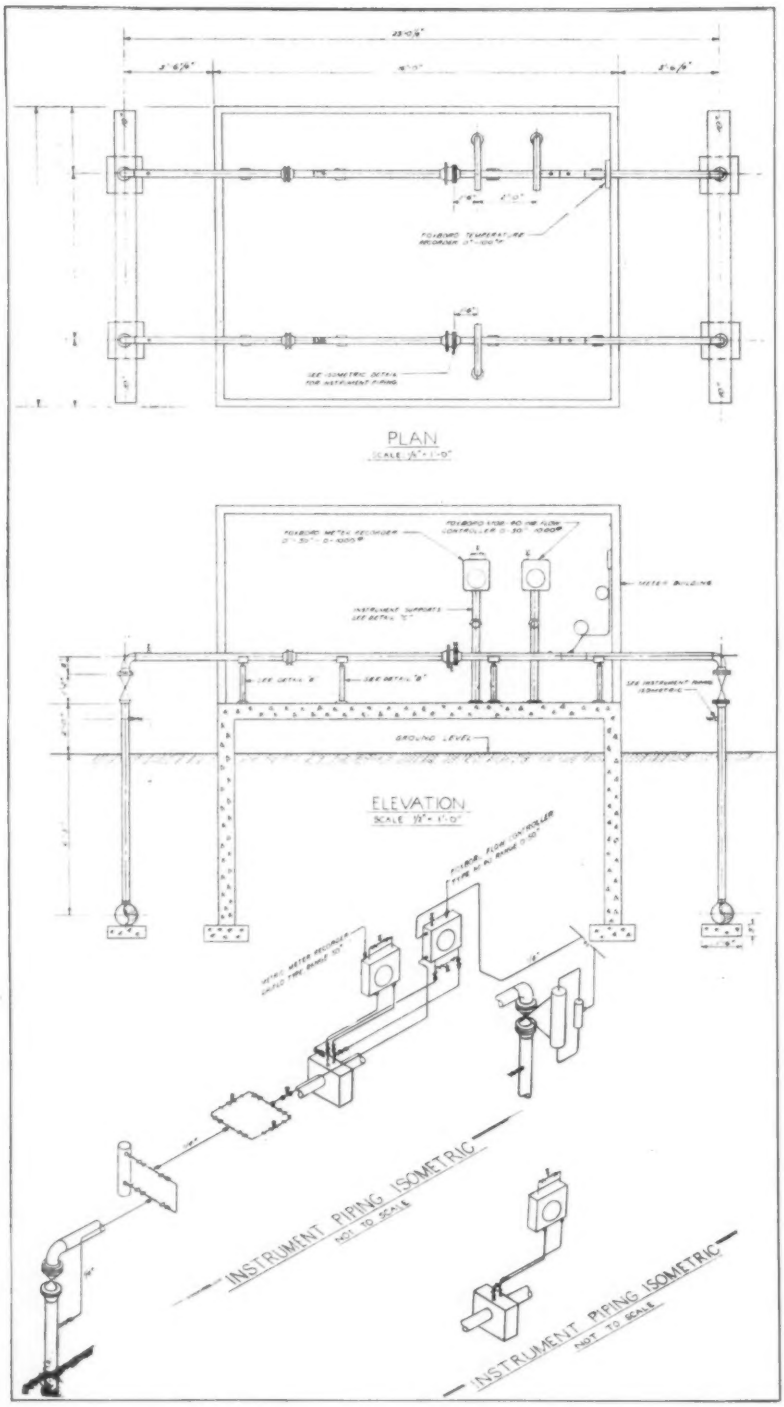


Fig. 2. A typical orifice meter station for a utility-customer sales point on Trans-Canada's transmission system.

served during the 1957-58 heating season.

The pipe

Basic pipe for the system will be API 5LX-52 line pipe. Wall thickness for mainline pipe will be:

34-in. OD—0.375-in. WT.
30-in. OD—0.375-in. WT.
24-in. OD—0.250-in. WT.
20-in. OD—0.250-in. WT.

The 34-in. "super-inch" pipe was rolled at the McKeesport, Pa., and Orange, Texas, mills of National Tube Division of United States Steel Corp., and the Houston (Texas) mill of A. O. Smith Corp. Approximate cost was $30 million.

About 600 miles of 30-in. pipe was ordered from South Durham Steel and Iron Co., England. This order involved about $32 million.

Some 878 miles of 30-in. pipe was ordered from Welland Tube Ltd., Welland, Ont., costing $45 million. Also, a $9 million order for 335 miles of 20-in. pipe was placed with this Canadian firm.

Meter stations

A master measuring station is being constructed on the Alberta-Saskatchewan border where the system originates at the Saskatchewan gate. Just 85 ft east of the last Alberta Trunk Line gathering system's block valve, the Trans-Canada pipeline starts. It enters the station as a 34-in., 0.500-in. WT inlet line; passes through an Aerotec gas scrubber and into a 34-in. meter station header. Two orifice meter runs will be installed initially. However, the inlet and outlet headers are cut and blanked off so that four additional orifice meter runs can be flanged in. Details of this station are shown in *Fig. 1.*

A typical orifice meter station for a sales point is shown on *Fig. 2.*

A typical positive meter station for a smaller utility customer is shown on *Fig. 3.* The meter is specified with a 1000 psig maximum working pressure. These

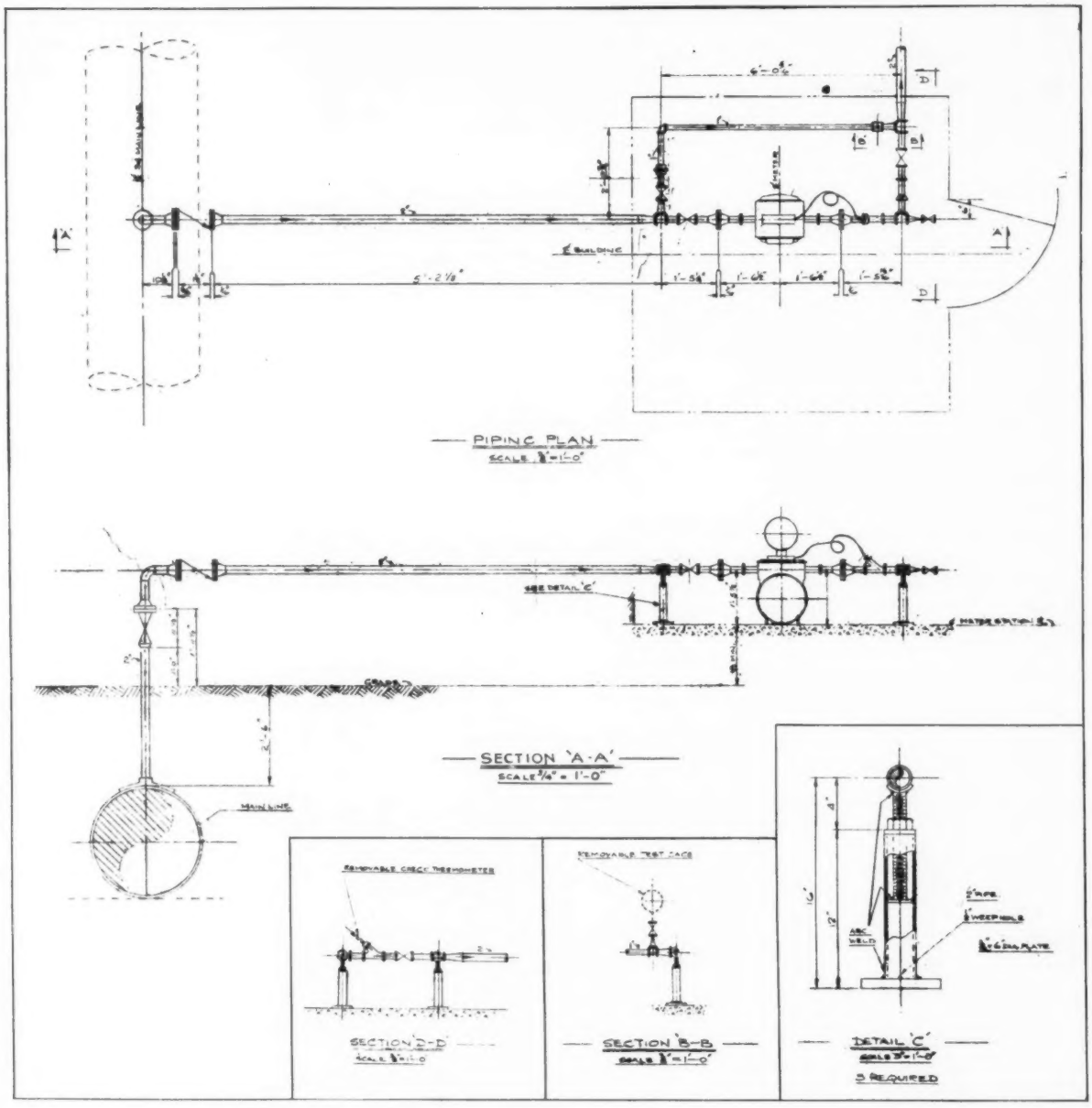


Fig. 3. Typical design for a positive-meter measurement station to serve utilities with relatively small takes.

meters are being made with ductile iron cases poured at the Alhambra (Calif.) foundry of Reliance Regulator Co. for Canadian Meter Co.

The ambient temperature range expected at various metering points affect design and selection of material at measurement stations. Foundation design for meter houses was specially considered to maintain level tubes or meters (see *Fig. 4*). And fuel gas and heating systems are provided in meter houses of major measurement points.

Mainline block valves

The mainline block valves are spaced at an average 16-mile interval. They will not be equipped with automatic valve operators when the initial pipeline system is completed. However, the valves have been specified with elevated gear housing, which will permit installation of valve operators if it is desired to so equip them at a later date.

For the 34-in. mainline, ASA 400 psig 34-in. x 30-in. x 34-in. lubricated plug valves with worm, elevated gearing will be used. Recovery tubes have been specified.

On 30-in. mainline, block valves will be 30-in. x 24-in. x 30-in. 1000 psig WOG, lubricated plug valves. These will be venturi pattern, worm gear-operated, with pressure recovery tube, and elevated gear housing.

Both Rockwell and Walworth valves will be used. A typical block valve assembly for 30-in. mainline application is shown in *Fig. 5*.

Compressor stations

Gas-field wellhead pressure will be sufficient to supply adequate volumes to the limited markets that will be connected to Trans-Canada's system for the 1957-58 heating system. Therefore, no gas compression facilities will be constructed this year.

With the arrival of thaw-out in the spring of 1958, construction may begin on four compressor stations totaling 27,700 hp for Trans-Canada Pipe Lines. Also, the Crown Corp. will build a 5000-hp station in 1958. However, exact horsepower, type and location will depend on several variables.

Straight reciprocating, gas turbine-driven centrifugal, and gas engine-driven centrifugal machinery are being considered. It is not known at the time of this writing what the selected prime-mover and compressor units will be. Probably, a combination of reciprocating and centrifugal compressor ends will be included in the design of the stations.

Water supply for stations will be generally good along the route of the pipeline. However, there could be water problems in the western end of the 34-in. section. Another compressor station design consideration will be the effect of the Canadian temperature range and the expected temperature minimums and maximums. The foundation design will have to be given particular attention, as will the compressor station water supply and cooling water system. Buildings will also have to be more weather resistant than is the case of the average compressor station in the States.

The design of total compressor station horsepower and spacing is directly related to the outcome of the Midwestern Gas Transmission FPC hearings. Should the Mid-

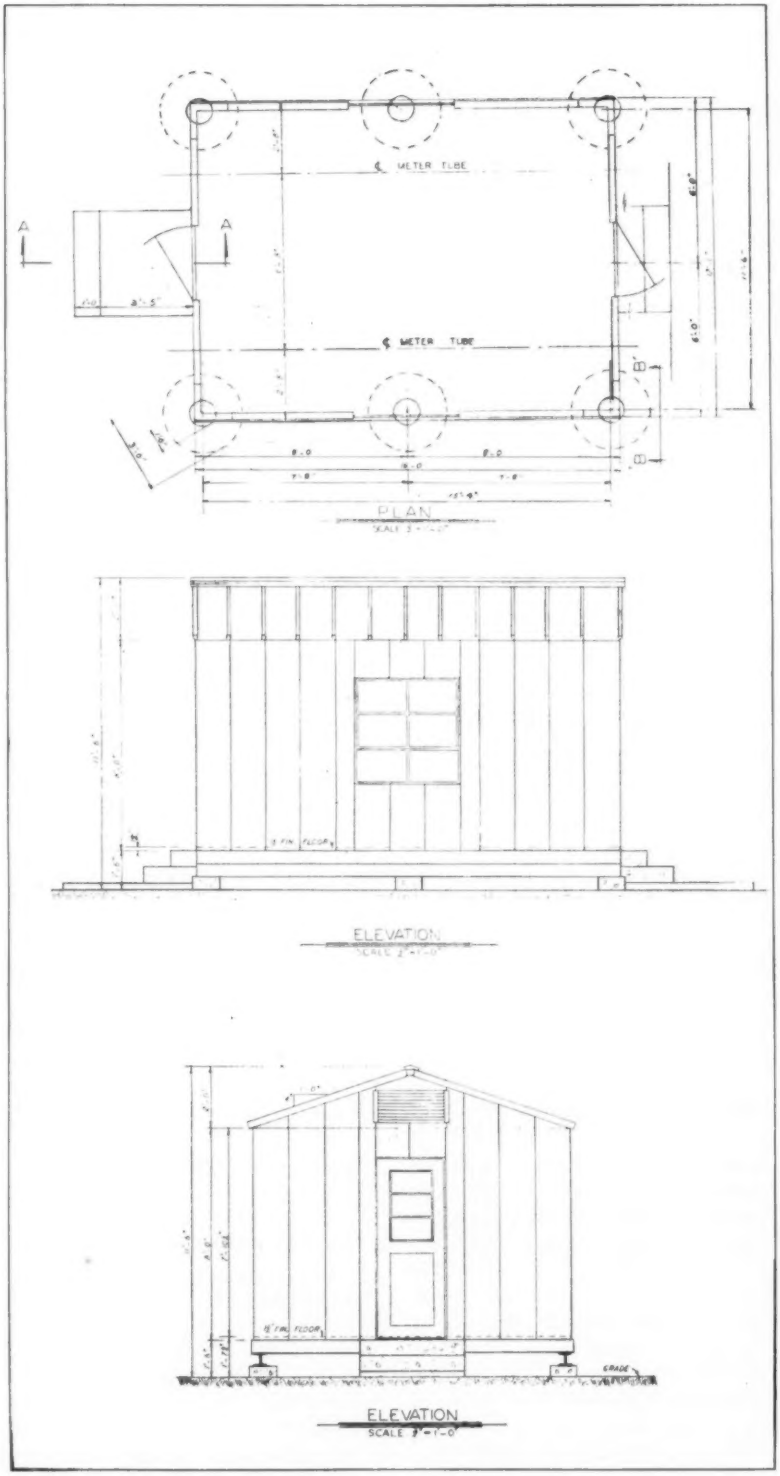


Fig. 4A. Typical field house for meter stations and other applications.

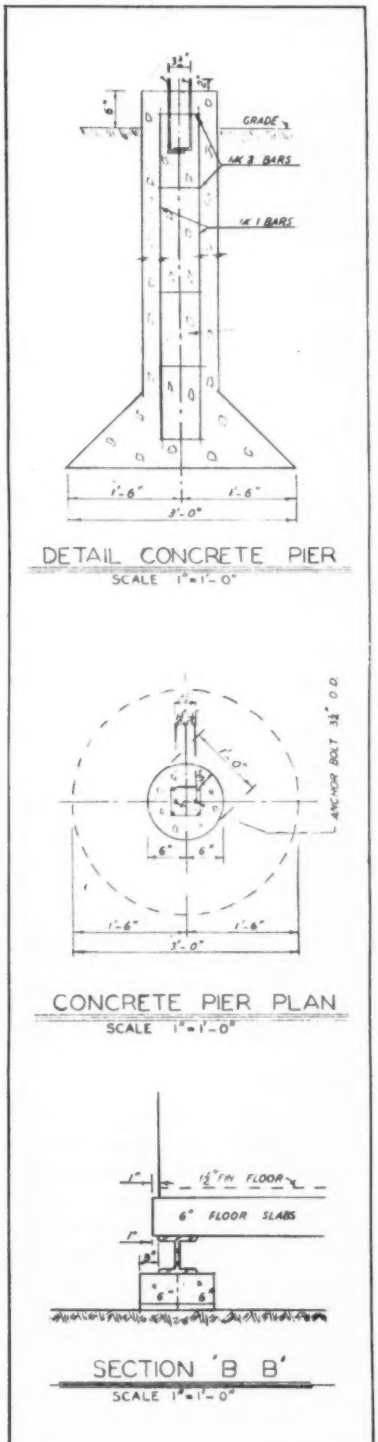


Fig. 4B. Details of unique foundation developed by Trans-Canada's engineers for field houses in the system.

western plans be certificated before the end of this year, additional stations and horsepower would probably have to be constructed next year. If the hearings drag out over a period of years—which is not unlikely—the development of additional compressor stations would be delayed. In any case, preliminary plans for the ultimate development of the pipeline indicate 19 compressor stations will be required.

As previously mentioned, there will be no compressor stations constructed in 1957. But the sidegates are being built into the line and stubbed off as shown on *Fig. 6*. This is for a station on the 30-in. mainline; however, it is typical for 34-in. and 20-in. stations.

Drip assemblies

Fig. 7 shows a typical drip assembly with 24-in. barrel for 30-in. mainline installation.

Water crossings

Lakes, rivers and streams pop up frequently on the all-Canadian route of the Trans-Canada pipeline. There are eight lakes that must be crossed. Some 99 rivers will be traversed, and 77 streams, creeks and canals. In addition, there are about 139.25 miles of real swamp to go through and potholes, pot lakes and muskeg bogs too numerous to mention.

Lakes are typically crossed with a single run of mainline-diameter pipe with increased wall thickness. Crossing the 1.2-mile wide Lake of Two Mountains, near Montreal, will be the longest water crossing.

Typical river crossings are made with dual mainline diameter runs manifolded on both sides of the river banks, outside of floodplains. Manually operated crossing block valves are installed.

Underwater segments of the pipeline are given the normal coating and wrapping specification. Rock shield is banded on over the submerged run. Then the river weights are added. Picket-mat shields are wired on between river weights.

Thousands of saddle river weights are called for on sections that will run through muskeg swamps and potholes. Some of these swamp runs extend for over 1000 ft. Alberta Trunk Line now has a structural steel overhead pipeline bridge under construction that will bring two 34-in. lines over the Saskatchewan river.

Railroad and highway crossings

Fig. 8 shows a road crossing detail. This is typical for the 202 highway crossings and 96 railroad crossings that will be made for the 2294-mile pipeline.

Field house foundations

Design of foundations for meter, regulator, and other field houses has been given a unique treatment. Due to variable moisture content of ground that alternately freezes and thaws, and due to the wide temperature ranges experienced in Canada, the design shown in *Fig. 4* has been evolved. These are supported by 6-in. WF H-beams, at 25 lb/ft. Beams rest on 6 bell-bottom piers, as shown.

This foundation technique will keep building movement at a minimum to hold meter tubes level and prevent lateral position changes.

Coating and wrapping

As construction progresses on the Trans-Canada pipeline, provisions are being made for eventually putting the system under cathodic protection. Insulating sets are being installed in appropriate fittings to electrically isolate meter installations and other facilities.

The pipeline is being coated and wrapped over the trench. Pipe is being cleaned and primed by line-traveling machines. Then, a 3/32-in. coating of hot pipeline enamel is applied. This is followed by Fiberglas and Kraft paper wraps. Fully plasticized enamels — Bar-

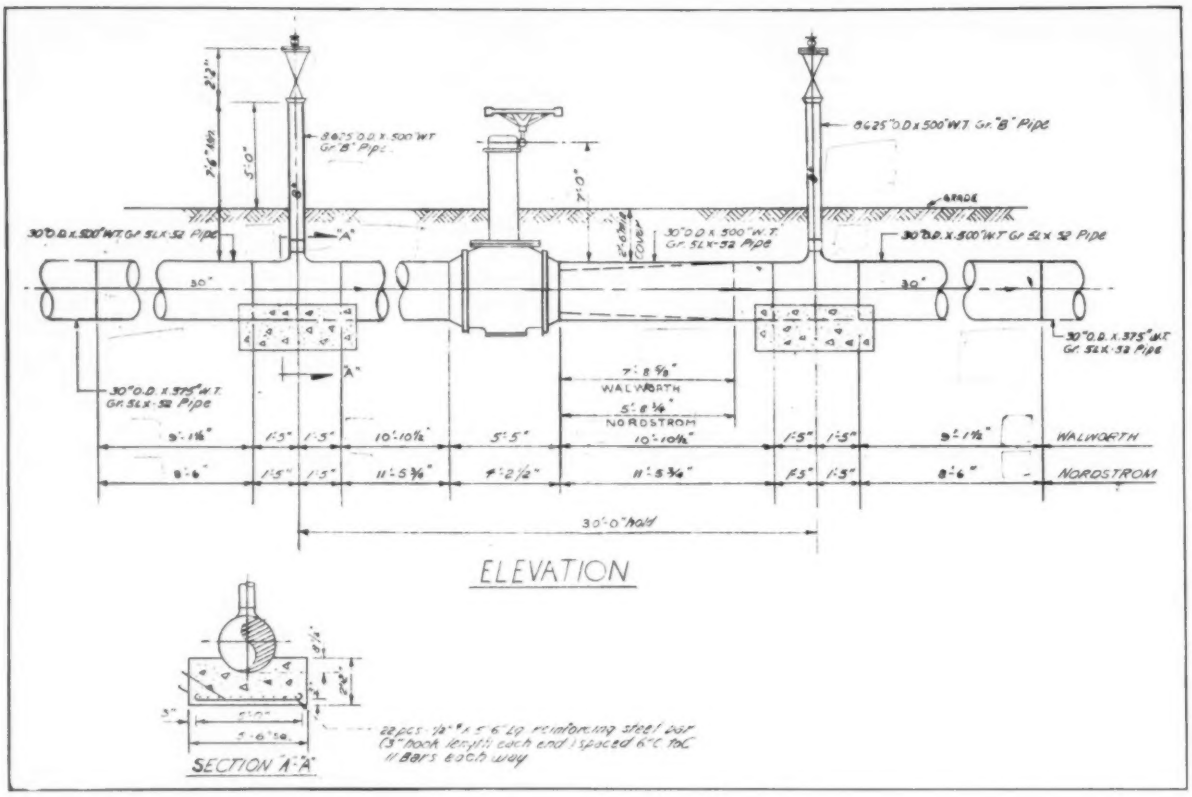


Fig. 5. Typical mainline block-valve assembly.

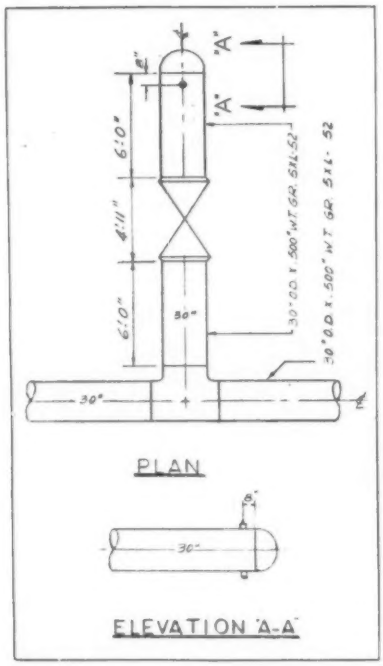


Fig. 6. Typical drawing for compressor station side gates to be built prior to compressor station construction.

rett's AA and Koppers' Bitumastic 70-B—are being used to take advantage of the wide range of application temperatures that are practical and the ability to stand up at below-zero temperatures. On some sections asphalt-based enamel and a felt wrapper will be used.

Fabricated piping at meter stations and other irregularly shaped assemblies are being wrapped with Trenton Nono-ply "Mummy Wrap" to 1 ft above established grade line. Piping supported on concrete blocks or foundations is to have the underside coated with ⅛-in. of Pittchem No. 16 Tarmastic. This specification applies to all metal surfaces contacting concrete.

Coating is protected with W. R. Meadows Inc. pipeline rock shield or Keystone Asphalt Products Kapco rock shield through the 350-odd miles that rock is encountered in important quantities along the route. Rock shield is also used on the river crossing runs between the coating and concrete river weights. Wooden picket type mats are bent-on over the rock shield between weights.

Communications

Trans-Canada Pipe Lines wants to get well established in the gas transmission phase of operations before making a decision on ownership of a permanent communications system. Therefore, it is leasing its entire communications program from Trans-Canada Telephone System for the initial years, at least.

Trans-Canada Telephone is an association of major Bell system telephone companies in Canada. They are providing a combination of wire line and VHF short wave system to Trans-Canada Pipe Lines under a lease that covers equipment and maintenance personnel.

The system in use on the western Canadian prairies this year—between the Alberta - Saskatchewan border and the Manitoba-Ontario border—where the spreads were busy at heavy pipeline construction was VHF radio-telephone. This provided fixed point-to-point; fixed point-to-mobile, and mobile-to-mobile communication. Trans-Canada Telephone owns and maintains all of the equipment and service leased to Trans-Canada Pipe Lines.

Dispatch center while we were in the field was at field construction headquarters in Winnipeg, Man. The communications links were provided by a number of VHF towers spread over the rolling prairies roughly paralleling the trans-Canada highway, which is, in turn, roughly paralleled by Trans-Canada's gas transmission system.

About 60 mobile units were operated by Trans-Canada Pipe Lines' field superintendents, right-of-way men, engineers, inspectors, agents, etc. Mobiles could operate effectively all along the right-of-way. If a mobile radio-equipped unit wanted to communicate with a dis-

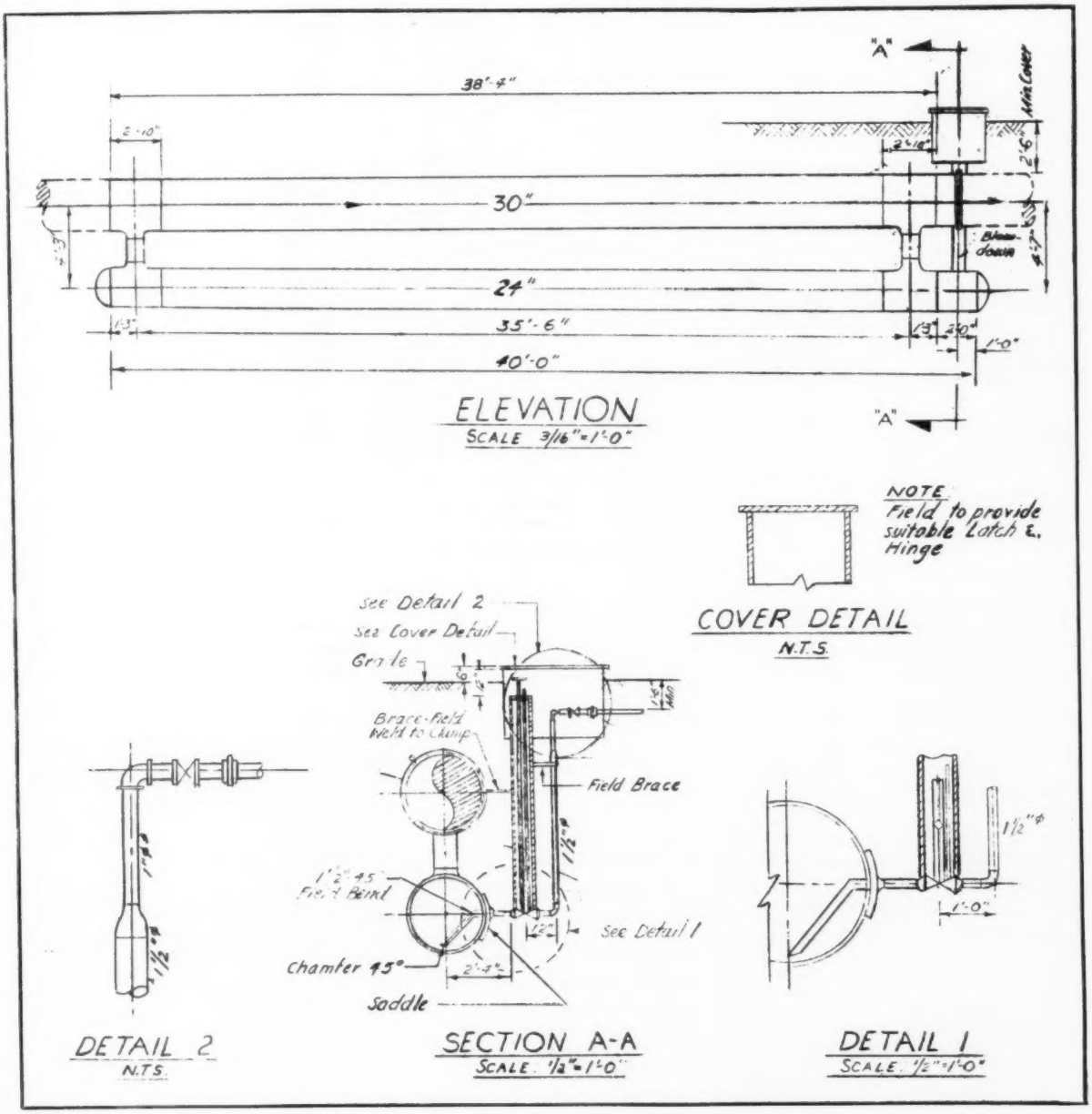


Fig. 7. Design of a typical pipeline drip installation for the Trans-Canada system.

tant mobile unit, the originator contacted the Winnipeg dispatcher by toning his transmitter which activated the nearest tower. The dispatcher was given the mobile unit the originator wished to contact. Dispatcher then dialed to activate the nearest tower to the mobile unit with which communication was desired by the originator, and messaged that the originator wished to speak with him. The mobiles then communicated freely. Fixed point-to-point communication was handled by a similar manner. Some fixed point-to-point was handled by wire line handling normal toll service.

By fall of 1958, when the initial pipeline system will be operative, the communications system will use two channels; one for linking offices and compressor stations on a party net, and one to provide the mobile communications. Regular toll links will be used to communicate with utility customers. Also, TWX service is planned between Toronto and Winnipeg.

Pipeline operations will be controlled from Toronto, Ont., with four division offices providing operation control on the local level.

No telemetering will be done on the initial system as completed in 1958. However, there are studies under way that will probably result in telemetered monitoring of all input and delivery points in the future. Initially, at such time as it is decided to go into this phase, the telemetering will be accomplished through leased facilities.

Remote control of compressor stations is a possibility, but strictly for the future. None is scheduled or planned at this time. But prime movers to power compressor units will be ordered with the specification that they be readily adaptable for remote control and supervision operation.

After operation of Trans-Canada Pipe Lines' initial pipeline system is well established, the company plans to reconsider purchase of a wire line or microwave communications system. Engineers have thoroughly studied available communications media. Investigation of radio communications under this project has evaluated both regular and forward scatter microwave.

General construction features

The entire pipeline is to be solid welded. Welders must qualify under current, applicable codes and tests, under the supervision of Trans-Canada's welding inspectors.

Welds are X-rayed in strict accordance with frequency in excess of that specified in the ASA B31.1.8-1955 Code. Last year, field X-raying on the western section was contracted to Industrial X-Ray Service (Seattle, Wash.). This summer Richardson X-Ray Service (Alhambra, Calif.) had the contract and was in the field also with its mobile units and laboratories.

Ditch for the 34-in. OD pipe of the western section was specified as 6 ft deep with about 4-ft width at the top. For the 30-in. pipe in the central section, depth will be reduced 4 to 4.5 ft and will be padded in the very rocky stretches that will be encountered.

Overbends, sag bends and lateral bends up to 15 degrees will be machine-bent in the field. Other transitions will be made with fittings conforming to applicable codes.

Cleaning and priming, and coating and wrapping operations are being done over the trench. Shield is being used where the coating might be subjected to mechanical damage. Holiday inspections follows application machinery over the trench.

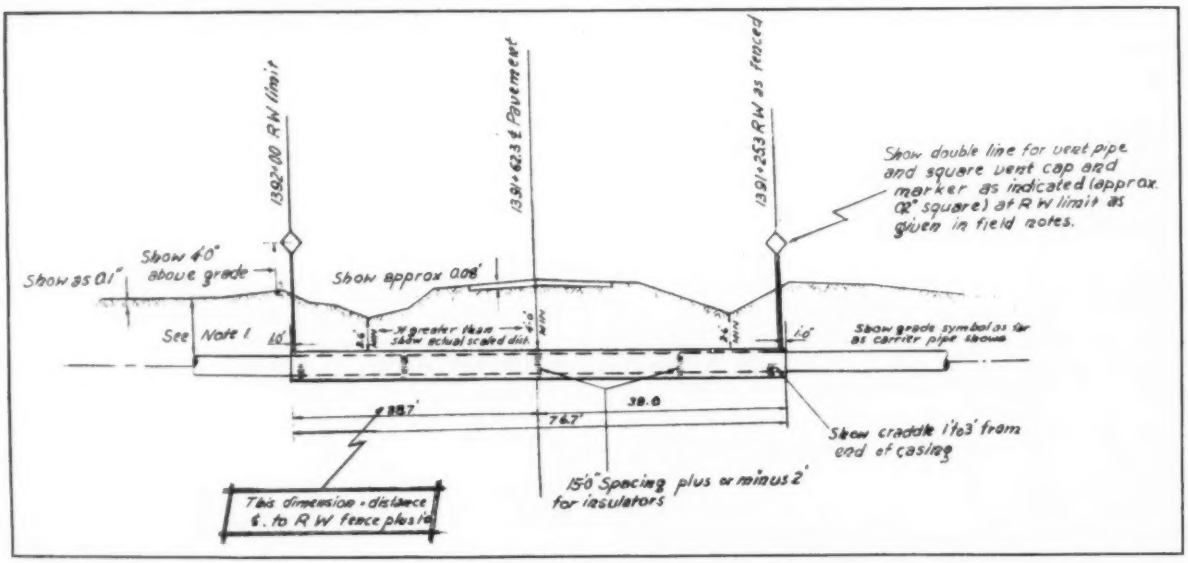

139+00 R/W limit
139+62.3 ± Pavement
139+25.3 R/W as fenced
Show double line for vent pipe and square vent cap and marker as indicated (approx. 12" square) at R/W limit as given in field notes.
Show as 0.1'
Show 4'0" above grade
Show approx 0.8'
See Note 1
16'
Show grade symbol as for as carrier pipe shown
38.0
76.7'
Show cradle 1'to3' from end of casing
150' Spacing plus or minus 2' for insulators
This dimension = distance ℄ to R/W fence plus 16'

Fig. 8. Typical highway crossing design. Railroad crossings are essentially similar.

Building the Trans-Canada project

CONSTRUCTION

Preparation for shooting hard rock near Falcon Lake, Man., on Majestic Contractors, Limited's, work on spread 7.

ALONG the gently rolling plains of highly cultivated western Saskatchewan, Canadians were buzzing about the sight of flatcar loads of heavy equipment moving into their farming and grazing country in June and July of 1956. To some Canadians the equipment was familiar. To most, it probably was not.

Some of the rurally orientated citizens of Saskatchewan knew what the equipment was moving in for. Again, most of them probably did not. It was not long, however, before most of them knew and applauded the fact that the long-awaited, often-stalled trans-Canada natural gas pipeline was getting under construction.

Industrial pioneers were integrating the labors of financiers, accountants, telephone operators, clerks, engineers, and many, many others with mountains of material and equipment to produce new energy supply to a nation. The land—Canada — has seen many previous pioneering spirits conquer nature and less intrinsic obstacles. Now they were to see pipeliners roll over the prairies with a modern-pioneering spirit.

So, on June 17, 1956, 34-in. steel line pipe arrived at Burstall, Sask., and construction of the trans-Canada pipeline started. We don't know if officials (and just plain working people) of Trans-Canada Pipe Lines danced jigs in Calgary and Toronto, but we suspect they did do mental handsprings of joy and relief. It they didn't, they should have. The road to actual construction had been many miles long—it took seven years to travel. Every inch of it was uphill.

Trans-Canada's pipeline

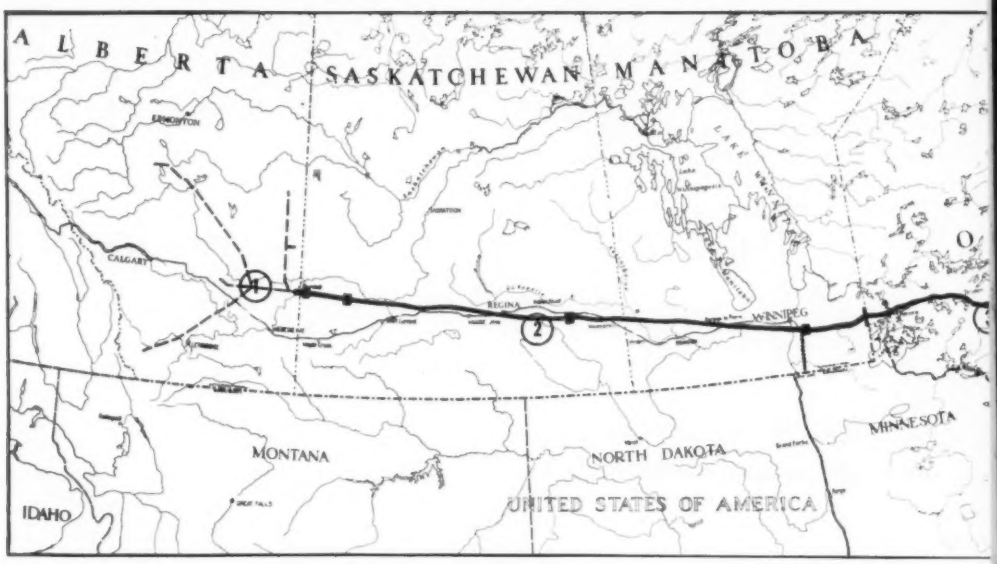
Moving natural gas from Alberta's producing fields to the most eastern market will be accomplished through the longest gas pipeline ever constructed as a single project. Trans-Canada Pipe Lines has designed it as a 2294-mile trunkline. It will take an all-Canadian route. Actually, as far as seasoned pipeliners are concerned, it will not be too hard to build. But it will rank well on any list of engineering feats completed in Canada.

Designed initial delivery capacity (Nov. 1, 1958) is for 300 MMcf/day through the system. Its designed maximum capacity will be 780 MMcf/day. It starts on the Alberta - Saskatchewan border. It ends at Montreal, Quebec.

Trans-Canada's transmission system has been divided into three sections:

Western section — From the Alberta-Saskatchewan border (near Burstall, Sask.) to just east of Winnipeg, Manitoba. The pipeline section will be 586 miles of 34-in. OD pipe.

Central section—From near Winnipeg to a point very close to Toronto, Ontario. This section will be 1251 miles of 30-in. OD pipe. A piece of the central section will be financed and constructed by the Crown Corp. — Northern Ontario Pipe Line Crown Corp.—and leased



to Trans-Canada with an option to buy. The Crown Corp. segment is for about 675 miles of 30-in. from the Manitoba-Ontario border to Kapuskasing, Ontario.

Eastern section—From near Toronto, Ontario, to Montreal, Quebec. This run will be 308 miles of 20-in. OD pipe. Another 33-mile, 24-in. leg is in this section. It will connect the mainline system with Western Pipe Lines' Niagara-Sheridan line — currently under lease to Niagara Gas Transmission, a subsidiary of Consumers' Gas Co. of Toronto.

Operational schedule

Western section — Work is moving at full swing in this section. It is scheduled for completion to Winnipeg, and will be in operaton, soon after Sept. 1, 1957.

Central section—The Crown Corp. will finish its schedule as far as Port Arthur-Fort William this construction season. The communities of Kenora, Dryden, Fort William, and Port Arthur — with distribution systems operated by Northern Ontario Natural Gas Co. Ltd. (not the Crown Corp.)—are due to be tied-in for natural gas service by Nov. 1, 1957. The remainder of the central section will be completed in the spring and summer of 1958.

Eastern section — This section will be completed during the current construction season. A 12-in. line from Morrisburg to Ottawa is scheduled for construction in 1957.

Overall initial pipeline system—The initial phase of Trans-Canada's project will be completed and in operation by not later than Nov. 1, 1958. No compressor stations will be constructed this year. Compressor horsepower will be built into the system during 1958.

Construction during 1956

In June of 1956 pipe mills in the United States were rolling steel plate into 34-in. OD line pipe for the first 586 miles of Trans-Canada's pipeline. But they didn't roll long. Unions struck most of the U. S. steel industry and Trans-Canada's line pipe lay awaiting to be rolled.

An initial delivery was made before the strike fouled up the pipe supply. This 48-car shipment of 40-ft joints of super-inch pipe stacked eight-to-the-car rolled into quiet little Burstall, Sask. on June 17 and set the local-color boys to buzzing. We wonder if Burstall is likely to forget the pipe, pipeliners, and pipeline that came and went during the summer of '56?

Construction plans called for seven spreads to string-out and make pipeline between Burstall and the Manitoba border during 1956's construction weather. Four contracts for spreadwork were let. Then the U. S. steel strike struck.

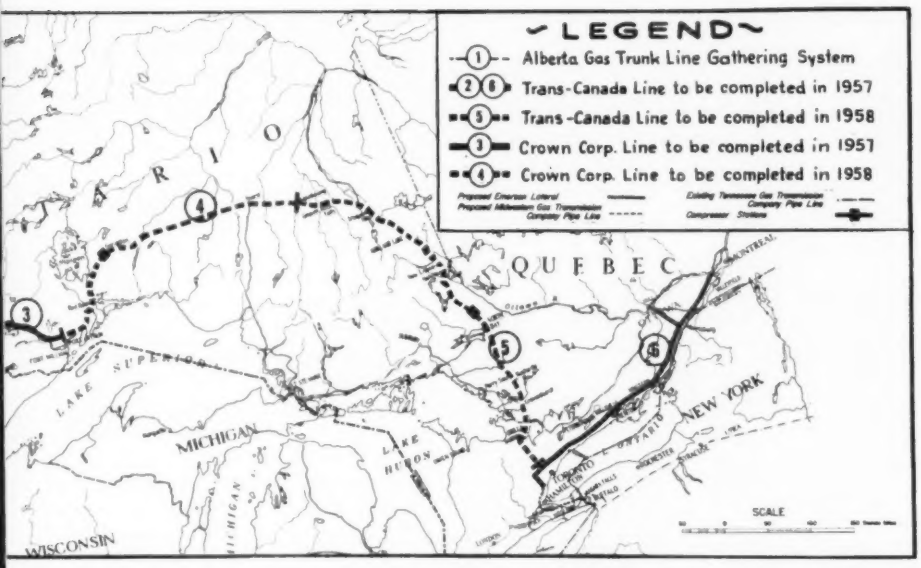
Trans-Canada was aware of the touchy steel situation in the U. S. and had been stockpiling and stringing in hopes that it would get enough pipe for the western section before negotiations between steel management and steel workers hit the gasket-blowing stage. However, they didn't make it.

After pipe supply was closed off, the decision was made to keep two construction spreads—already strung-out and working on the western section—supplied with pipe that had been delivered. So, Majestic Contractors Ltd. (Edmonton, Alberta) and Canadian Bechtel Ltd. (Vancouver, B. C.) were told to take-off and build pipeline until the pipe ran out.

Majestic Contractors and Canadian Bechtel both had new equipment on their spreads. And it was super-inch equipment. They made good time through country that cannot be considered very rough by pipelining standards. They didn't have to push too hard to lay a mile to a mile-and-a-half of 34-in. pipeline a day. That's pretty fair progress for pipelining even with smaller diameters.

Canadian Bechtel doubled-jointed most of the pipe it laid in '56 until the steel situation made deliveries so uncertain that the jointing yards were shut down. Semiautomatic

Map above shows the 2294 mile route of Trans-Canada pipeline.



submerged arc welding was used in the yards to turn two 40-ft joints into a single 80-ft joint. The first yard was set up at Morse and later followed the pipeline in a move to Archydal. This operation was continually hampered by pipe shortages. Finally, it was bypassed altogether as pipe was rushed directly to general superintendent Joe Work's eager pipe gang.

Canadian Bechtel finished its 110-mile schedule and, as the weather was still good for Saskatchewan with minimum temperatures still high (in the 20's), kept making pipeline. They went right on by the end-point of their schedule—Trans-Canada's spread 2—and about 15 miles into spread 3 before the weather, and other considerations, urged them to break it off for the winter. They finally stopped at Pense, Sask., very near Regina.

Majestic did all of its welding on the line and also made good time on its schedule—Trans-Canada's spread 1. They built from Burstall to the Swift Current area. And they had some good days. For instance, on Aug. 5. this spread welded 8000 ft of 40-ft joints.

Sages of the area had predicted rough construction for Majestic Contractors when they hit the Great Sand Hills section of western Saskatchewan. The spread simply took them in stride. The sand hills are loosely packed, fine-grained sand of considerable depth. They are covered by a semi-topsoil crust about 6 in. thick. Naturally, Majestic lost a little trench to shifting sand, but not nearly so much as had been expected. Toughest problem in the sand hills turned out to be root structure of scrub-growth.

In all, 230 miles of 34-in. pipeline were built by the spreads during the summer of 1956. And the first river crossing—using the term rather loosely—was put under Swift Current creek near the city of Swift Current. All in all, Trans-Canada was well pleased with the spreadwork. The only regret was the pipe shortage that severely limited the miles of pipeline put into the ground during the first crack at actual construction.

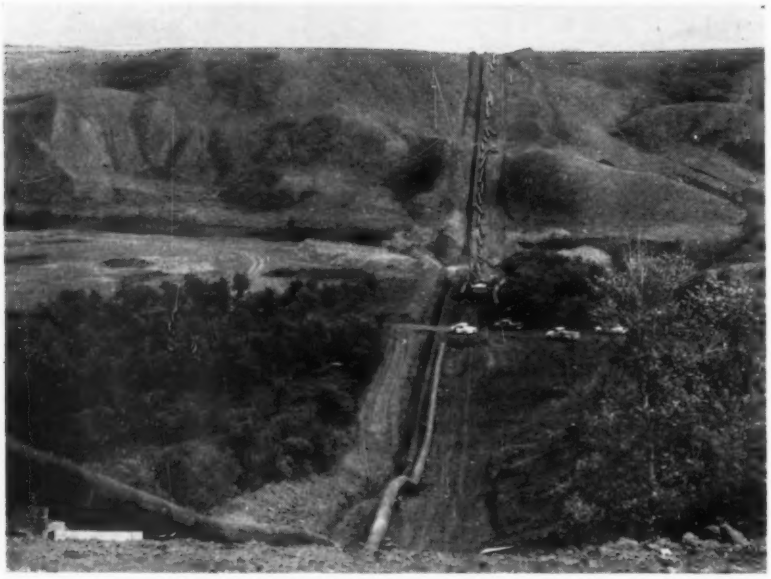
Construction during the winter of '56-'57

Winter in the prairie lands of Saskatchewan are not conducive to outdoor activities. However, neither Trans-Canada Pipe Line nor its contractors found time to be idle. They were out enjoying the "winter sports" phase of building the trans-Canada natural gas pipeline.

First, all of the right-of-way between Regina, Sask. and Winnipeg, Man. was cleared. Most of this extension is in the cultivated rolling prairies where such work is not too difficult. To accomplish it in other than "construction weather," however, was a very creditable task. As the right-of-way was worked toward Winnipeg, boulders became more numerous and light forests (for Canada) had to be cut through. Grading crews followed the clearing crews preparing the ROW for the onslaught of pipe, trucks and heavy equipment that are combined with know-how to build a pipeline.

The stringing trucks followed the clearing and grading people down the line during the winter. Pipe was strung or stockpiled along the right-of-way on some of the coldest days of the season. Men sacrificed their comfort time again and again to prepare the way for the construction spreads to really break-out after thaw-out. For practical purposes, pipe stringing was completed during the winter months for the Regina-Winnipeg section, and a lot of progress was made on the section Winnipeg to the Manitoba-Ontario border.

If anyone had cared to sightsee a trace in Manitoba while winter winds howled across prairies that were bleak indeed, he would have been shocked to see river crossings being made in temperatures as low as —40°F. Marine Pipeline & Dredging Ltd. (Vancouver,



First river crossing on the Trans-Canada project went under the Swift Current creek (near Swift Current, Sask.), in 1956, on Canadian Bechtel's spread 2.

B. C.) pulled an "operation deep freeze" of its own by putting in dual 34-in. crossings at two separate locations on the Assiniboine river — one near Miniota, Man., and the other at Portage la Prairie in the same province. Not a single case of heat stroke was reported from these operations. (See GAS, January 1957, page 142.)

These operations progressed slowly, but under such conditions the completion of any river crossings at all is very creditable. Another example of the drive that was given the project once Trans-Canada was able to start construction in earnest.

Another outstanding construction achievement of the winter was turned in by Price-Poole Pipeline Constructors of Canada. This enterprising Canadian venture of the H. C. Price Co. (Bartlesville, Okla.) developed a new automatic position welding technique that was used for double-jointing yard work during the dead of winter (see GAS, May 1957, page 160). Most welding comes to a screeching halt when —40° temperatures become routine, but the Price-Poole method and equipment conquered the coldness and produced good welds. This double-jointing operation gave this spread a good jump on time when it finally got kicked off for summer '57 work.

Construction during 1957

Touring the spreads at work on Trans-Canada's new transmission system this summer produced a trip we will not soon forget. The spirit of a vibrant, growing Canada invades your calm as the International Boundary is crossed. You soon meet a Scot who has pulled up stakes and headed for Canada in hopes of getting a better shake from this nation. He tells you his electrical engineering education quickly produced a good job and he has wired for his bonny lass (aren't they all?) to take the next Constellation for Canada. You get the impression he may try to run all of Canada in another 30 days.

Then you run into Hungarian refugees carving a new home for themselves in a Canada that is welcoming—in most circles—this pool of additional professional trade and laboring people. These peoples are breathing a new air of freedom too. Their hopes are high and they are ready to meet the challenge of tomorrow.

And one is apt to meet some Canadians, if he isn't careful. One instinctively likes these Canadians. They are a hospitable, generous and friendly people. You feel at home with them after very few minutes of conversation. Canadians are very polite. The waiter in the restaurant makes you feel it was a pleasure to serve you; taxi drivers are simply all out of character—they are too nice; public transportation reservations agents and others are actually trying to be helpful. In short, Canada is a wonderful country full of some very pleasing people. Our only complaint: it is very difficult to obtain adequate refreshments of a Sunday.

You are instilled with the feeling that perhaps you should take a flyer up Canada way. After all, you say to yourself, this country is just developing. What it is now and what it will be 50 years from now will be two different things. Here is the place to go out on one's own. To start development of that financial and industrial empire that we are never able to get rolling in the "states." Before long, you have bumped into the Canadian who just happens to have the penny stock—was it a platinum or titanium deal he had cooking?—available that will net you the first million. But, we failed to accept the challenge of empire-building (our own) on the Canadian stock market and took a straight shot for Toronto.

In Trans-Canada's Toronto offices, it is difficult to remember that you are not in the Commerce building in Houston. You see, "several" Tennessee Gas Transmission personnel are in Toronto on loan to Trans-Canada for the hectic construction phase of the latter company's development. Most of these will be replaced by Canadians when they can be found with, or trained to, pipeline operational skills.

From Toronto we trekked up and down the entire Trans-Canada pipeline route to take a look at the country, chat with suppliers, visit with distributors, and watch the pipeline spreads at work. We caught our first construction spread out near Regina, Sask. This was the Universal Pipelines Ltd.'s spread (actually owned by Mannix Ltd.) working on Trans-Canada's schedule or spread 3. The schedule extends from Pense to Wolseley, both in

Saskatchewan, for a distance of 75 miles. This is all 34-in. OD pipe. Another 15 miles of it was laid during '56 by another spread.

Spread 3 was directly south of the city of Regina when we visited it. That is, pipe was strung on the cleared and graded right-of-way at that point and the trenchers had opened trench in nice and firm, good digging ground. The rest of the spread was hanging back due to a series of potholes, one of which might well be called a lake. This lake had been dry for 75 years, according to old timers in the neighborhood. When the Universal-Mannix spread started to cross the "dry lake," it had converted to a definitely wet lake.

The potholes are funny things —but not to the spread crews— out there. The general country is flat with just ever-so-slight rolls. It looks arid, but wheat stubble is everywhere, so it is actually very fine grain-growing land. You would never expect to find potholes in it, but there they are. Potholes are not very deep or wide, but they make sticky going on occasion. Trenching machines can't hold trench through them, so they have to call up the backhoes and give them some tractor help. River weights—saddle type —are used for the larger potholes. It is odd to see the large concrete weights standing out on the dry plains. Rosson-Richards Co. (Houston) poured the weights, both saddle and clamp-on types, with a traveling crew that moved the pouring yard from village to village along the western section spreads.

R. P. Hutchinson is Trans-Canada's chief inspector for spread 3. He was not happy with the way the spread had strung out at the moment, but was well pleased with the welding and general progress to the potholes. The cleanup gang was doing an outstanding job in this highly cultivated area where farmers were ready to sow wheat right behind the spread.

Spread 3 was field welding all joints. Wind on this flat land was giving the welders a little trouble. But, shop-made wind screens were solving this problem.

Trenching gang was making fine progress in the near ideal soil. They opened a pilot trench with a pilot trencher and followed with a completion trencher with side blades. This produced finished trench to 6 ft depth with a 4-ft width at the top. They were in high gear and threatened to completely outpace the middle and tail end of the spread.

Trans-Canada's spread 4 is being built by Dutton-Williams Brothers Ltd. This spread was headquartered in the rustic little town of Grenfell, Sask. We have nothing against Grenfell, but among other things it does not have is a water system. Drinking water is sold from a truck that passes through the streets. Going rate is 10 cents (Canadian) per pail.

The Dutton-Williams Brothers' spread covers 94 miles of 34-in. between Wolseley, Sask., to Miniota, Mant. They have some real pothole country to traverse.

The right-of-way cuts through plains sections to enter wooded areas where there is no poverty of the much-maligned potholes. One section we visited had hit over 60 potholes in a single mile. It was out of one for 50 yards and into another. Needless to say, there were ducks on every pond. What a land Canada is for wildlife.

As Williams Brothers' clearing and grading crews built the 60-ft wide ROW, they would use the birch, poplar, and other timber that had to be cut, for rip-rapping the potholes. Then, they sent welding teams along the line after the stringers and double-jointed in the field before the spread kicked off.

Spread 4 had some trouble getting qualified welders. They were not alone in this. Also, they were held up a bit by highway restrictions that prohibited moving heavy equipment over roads while frost was coming out of the ground and making soft spots every quarter-mile or so in most roads. But, once kicked-off, they levelled out and made good progress. They hit a little rock, but nothing that the backhoes couldn't handle. Like most of the spreads, Dutton-Williams Brothers had done a lot of preliminary work during the winter season. Sandy Wesson is Trans-Canada's chief inspector for spread 4.

The next spread was under contract to Price-Poole Pipeline Constructors of Canada, with field offices at Rivers, Mant. Their new double-jointing technique permitted them to maintain welding operations during severe cold snaps of the Canadian winter. When construction weather gave the go-ahead signal, double-jointed pipe was strung and the right-of-way was essentially cleared and graded in its entirety.

The Price-Poole schedule covers 98 miles of 34-in. pipeline between Miniota, Mant. and Austin, Mant.

Spread 5 also had trouble hiring qualified welders. But Canadian provincial governments cooperated with Trans-Canada in training welders. Many are now working on the pipeline.

This spread had relatively good country to traverse, but with a more frequent incidence of boulders and a touch of rock. Potholes were present, but not at sufficient frequency to cause appreciable trouble. Price-Poole had mostly new equipment on its spread, and when we left them they were well on their way to a successful construction season.

Trans-Canada's chief inspector on spread 5, Cecil Flippen, was watching it closely and was all over the place. He would be the

Trencher makes good time through ideal pipelining country east of Regina this summer. Pilot trencher opened trench. This machine followed through completing trench for 34-in. pipe.

Just east of Winnipeg, on Canadian Bechtel's spread 6, the Red river is crossed. Rock has just been hit in the river bed as barge with backhoe and dragline were about to complete the trench.

Typical spreadwork through a pothole in the Saskatchewan grain fields near Regina (spread 3) during 1957 construction. Universal-Mannix has the spread.

East of Grenfell, Sask., Dutton-Williams Bros. on spread 4 ran into real pothole country. Timber rip-rapping is in place to carry spread equipment along the ROW.

candidate for my two bucks if they ever have a steeplechase version of the Indianapolis 500-miler.

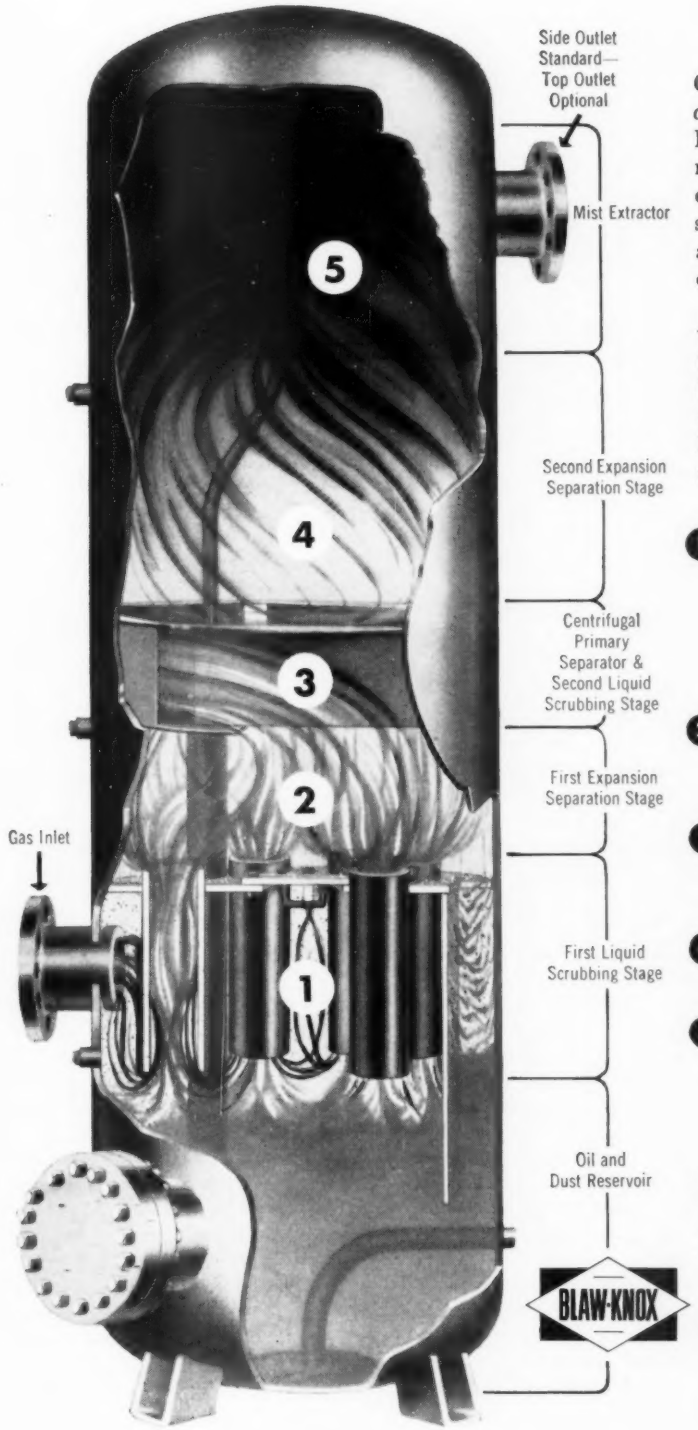
Crossings of the Assiniboine were made at Miniota and near Portage la Prairie. This river once bore the canoes of early traders and, later, the York boats of the Hudson's Bay Co. merchants. And ox-cart trails crossed the prairies where the Price-Poole spread currently makes pipeline, which is simply another more-modern medium for commerce in transport.

Spread 6 is under contract to Canadian Bechtel Ltd. The spread is well underway and is due to complete 87 miles of 34-in. pipeline between Austin and Ile des Chenes, both in Manitoba. Canadian Bechtel did considerable double-jointing during the fall and winter, and, of course, cleared and graded during the months weather made other than limited operations inadvisable. C. E. Bebell is chief inspector for Trans-Canada on this spread.

Canadian Bechtel's right-of-way also passes over some pretty historic ground. It passes right next to Portage la Prairie where pioneers established Fort la Reine in 1731. The fort was only 15 miles from Lake Manitoba and the portage was established that opened a new route from Montreal to Hudson's Bay—a very devious one involving many lakes and rivers. A pipeline crossing of the Red river is made just south of Winnipeg.

Spread 7, Majestic Contractors Ltd., is scheduled to build 85 miles of 30-in. between Ile des Chenes and the Manitoba-Ontario border. The country on this spread starts to get into some relatively long patches of hard rock. And a little muskeg and some potholes turn up. We went out to watch them shoot a section of hard, greenish slate. Rock bits on the twin-drill set were making about 12 ft of shot hole per sharpening. They were good for about

How Blaw-Knox Gas Cleaners remove damaging unseen dust



Gas Cleaner efficiency is judged by how *completely* foreign particles are removed—How much is collected is not an adequate measure. In many cases even so-called cleaned gas contains quantities of micron-sized dust particles (20 Microns or 0.00078″ and under) that travel the farthest and cause the most damage.

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2. First Expansion Separation Stage where oil and dust are separated from the gas just above the contactor tubes.

3. Second Scrubbing Stage where a centrifugal primary separator is used for agglomeration of small dust-laden droplets.

4. Second Expansion Separation Stage occurs just above the primary separator.

5. Mist Extraction Stage assures completely clean, oil-free gas. Remaining dirty oil returns to reservoir for settling before again contacting incoming gas.

Send for Bulletin 2450. It covers informative Blaw-Knox dust research data and outlines a simplified way to specify type and size of gas cleaners to meet your needs.

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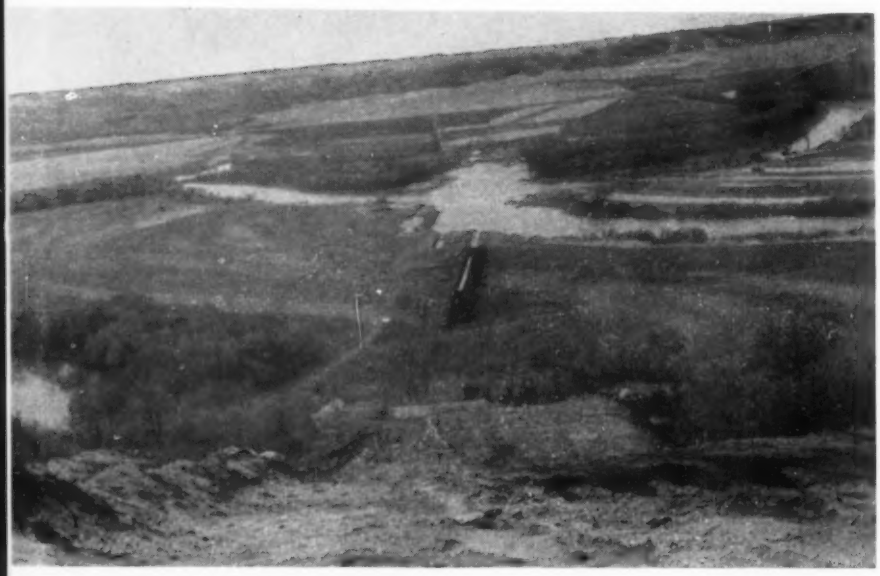

Trans-Canada's pipeline crosses the Assiniboine again. In all, about 99 river crossings will be made to complete the project. Price-Poole's spread 5 kicked-off here this summer.

350 ft before they were thrown away. The rock was not easy to break and move. The crew was experienced hard-rock men, and they made it look easy.

As Majestic's spread pulled away from Winnipeg, the country is still the flat-rolling prairie. Soon, however, it entered a marshy fringe that marks the transition from Canada's central plains to the coniferous zone. Then, they were into thick stands of secondary growth timber. Muskeg swamps and the good old potholes stayed with the spread as they dug and blasted past Falcon Lake region.

From the Manitoba-Ontario border to Kapuskasing, the pipeline will be built for Northern Ontario Crown Pipe Line Corp. However, this Crown section has been designed by Trans-Canada and the firm has been retained to supervise and inspect construction. Contracts have been signed for 310 miles of the 30-in. diameter Crown Corp. section.

Contracted sections will take the pipeline from the Manitoba-Ontario border to the "Lakehead Ports," the twin-cities of Port Arthur and Fort William. This section of the Crown Corp.'s route is interesting pipelining. Heavy rock excavation will be required for about 15-20 per cent of the route to the Lakehead ports, and water and muskeg will account for another 15 per cent of the mileage. The rock folds over gently out of the ground and back in to give the appearance of an oily wave. But, it is harder than water. At other places jagged outcroppings have been thrust upward to awkward positions. Most of the folds are marked with the engravings of glaciers that passed over them during earlier eras. Glacial till is experienced along the pipeline right-of-way to make the situation a little more interesting.

The rock is the first contact the Trans-Canada pipeline makes with the Canadian Shield. The Cryptozoic or Pre-Cambrian rock of the Canadian Shield has been a stable land area since late Pre-Cambrian time. It stands as an unyielding cornerstone of the continent. This great old coign includes an area of nearly 2 million square miles from a center over Hudson's Bay southward to the Great Lakes. It goes east to Greenland and west to Alberta.

Pink granite-gneiss dominates the tremendous area of the Canadian Shield. However, infolded ancient sediments and lava flows are scattered here and there. Some of the rock systems have thicknesses of 15,000 to 20,000 ft. It will not be easy rock to work with.

If the spread gangs get bored, there are still fairly heavy stands of conifers, and, more difficult, pot lakes. The latter are small, deep lakes with shores of sheer rock. Such pot lakes seemingly have no inlets or outlets. Most look awfully fishable.

Kenora, Ont., first town of any size east of the provincial border, is the gateway to beautiful, fabulous Lake of the Woods. Tourists come from all over the world to enjoy the fishing, scenery and other sports of the enchanting lake with its thousands of wooded islands.

From the border of the provinces to the Lakeheads, the ditching machines will not have much to do. Most of the trench will have to be backhoed or blasted. The pipe diameter is 30-in. OD, but it still has to go down 4 or 5 ft even in the solid rock. The hard rock crews will get workouts and it is doubted that the spreads will average a mile a day as was the case out in the prairies.

As the spreads work across lakes and rivers, they have to put the pipe in trench in the bottoms. The major river crossing in the Manitoba-Ontario border to Fort William-Port Arthur section, and perhaps the roughest crossing on the entire Trans-Canada project, is the crossing of the Winnipeg river near Kenora. This river flows from Lake Winnipeg to Lake of the Woods in a rock-

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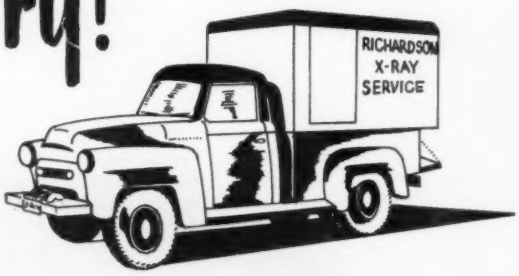

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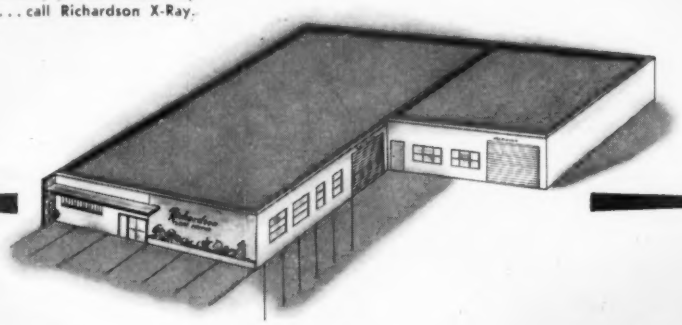

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bound course, and flows pretty swiftly. The crossing site selected is at a location where the river is about 2600 yards wide. Two existing rock islands will be used as anchor points on the half-mile underwater crossing.

After passing over the ground the right-of-way takes on its run from the provincial border to the Lakehead cities, we concluded that it will be difficult pipelining,

Near the Manitoba-Ontario border, timber shows the transition from prairies to timber-lakeland is well under way.

but not as rough as we have seen on other projects. And not nearly so difficult as we had been led to believe prior to our personal look-see. Mind you, to borrow a typical Canadian phrase, I wouldn't want the contract, but an experienced contractor with top hands, good equipment, and a little luck will be through most of the rough sections before the sidewalk construction engineers can get through telling why it can't be done.

Spread A of the Crown Corp. section was contracted with Dutton-Williams Brothers Ltd. Their work will be to take the 30-in. OD line from the Manitoba-Ontario border eastward for 57.7 miles to a point just east of an Ontario Highway 17 crossing. This relatively short section will cost about $3.678 million.

A new contracting company, Morrison-Shivers Ltd. (Leaside, Ont.) picked up the contract for spread B. This schedule is for 94.1 miles of the 30-incher from east of Highway 17 to a line separating the townships of Hyndman and Hodgson. This segment may be a little easier than spread A, but not too much so. About $4.57 million will be the cost of this schedule.

Majestic - Nelen Ltd. landed schedule or spread C, from Hyndman-Hodgson to Stedman township. This spread will build 80.4 miles at a cost of $3.82 million.

Spread D went to Houston Contracting Co. This schedule calls for 78.5 miles of 30-in. construction between Stedman and Forham township, just outside of Port Arthur. Cost will be $3.49 million.

From the Fort William-Port Arthur area, the Trans-Canada pipeline beats its way on across the Canadian Shield to Kapuskasing where the Crown Corp. ownership ceases. This section is scheduled for construction and completion in 1958.

The pipeline takes a decided southward trend as it starts out of the terminal city for the Crown Corp.'s pipeline section and heads for Toronto. It is still in great resort land and the way is not too easy, but, at the same time, it is more routine type of pipelining. Rock folds are still with it and there are the ever-present pot lakes. Timbering is still a major industry through this country, which attests for heavy timber. As way is made toward and into the Sudbury basin, mineral outcroppings and exposed diggings are not unusual. If you look closely enough, diggings can be seen that must have been the work of Indians seeking vermillion-hued earths to paint their warpath-bent brows.

Also as the eastern extremity of the Sudbury basin is approached, the pipeline leaves behind the rock, pot lakes and coniferous timber to get into the green, really green, open country that leads into the rich farm lands to the north of Toronto. Then, the pipeline hits Sheridan and makes a sharp eastward change in direction for Montreal.

The run along Lake Ontario and parallel with the St. Lawrence river to quaint, old Montreal, Que. will be pretty routine pipelining. There are some built-up, congested areas to penetrate, and busy highways and railroads to tunnel under. The longest water crossing on the pipeline will be made under the 1.2-mile wide Lake of Two Mountains as the project makes its approach to the Island of Montreal. ■

Fig. 1. Original evaporative equipment used at Blythe (right).

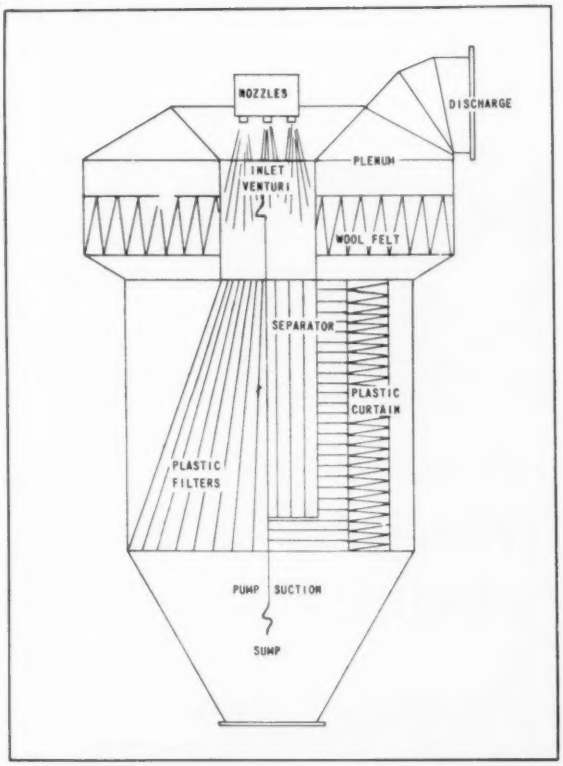
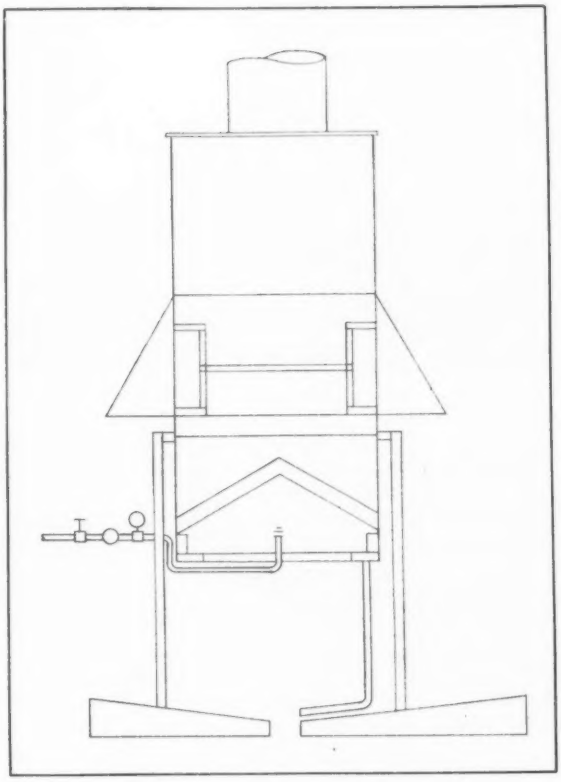


Fig. 2. Combination oil filter-evaporative cooler which was also used at Blythe compressor station (below).



More about water injection

By FLOYD R. CRAMER, Plant Superintendent
Southern Counties Gas Co., Blythe, Calif.

THE first attempts to eliminate detonation in our large, 2-cycle gas engines located on the desert at Blythe (Calif.) were based on experiments with evaporative cooling of the scavenging air stream. The original evaporative equipment (*Fig. 1*) proved to be remarkably efficient, and completely eliminated our detonation problem on the engine to which it was attached. Corrosion of the internal parts and salt deposits, however, became so much a problem that the cooler required continuous maintenance.

Also, the need for cooling during the spring, fall and winter months was not apparent. At about this time, one of the major filter manufacturers announced production of a combination oil filter-evaporative cooler (*Fig. 2*) which it had developed. We purchased one of these units, and for the purpose of comparative analysis, attached it to an engine adjacent to the original installation, and operated the two concurrently and at identical conditions. The original cooler still retained its remarkable approach capacity, but the combination unit proved considerably inferior in performance as an evaporator. Paradoxically, however, the combination unit produced appreciably lower combustion zone air stream temperatures. Also, total water use was found to be considerably higher in the combination unit, and it was obvious that we were applying moisture as finely

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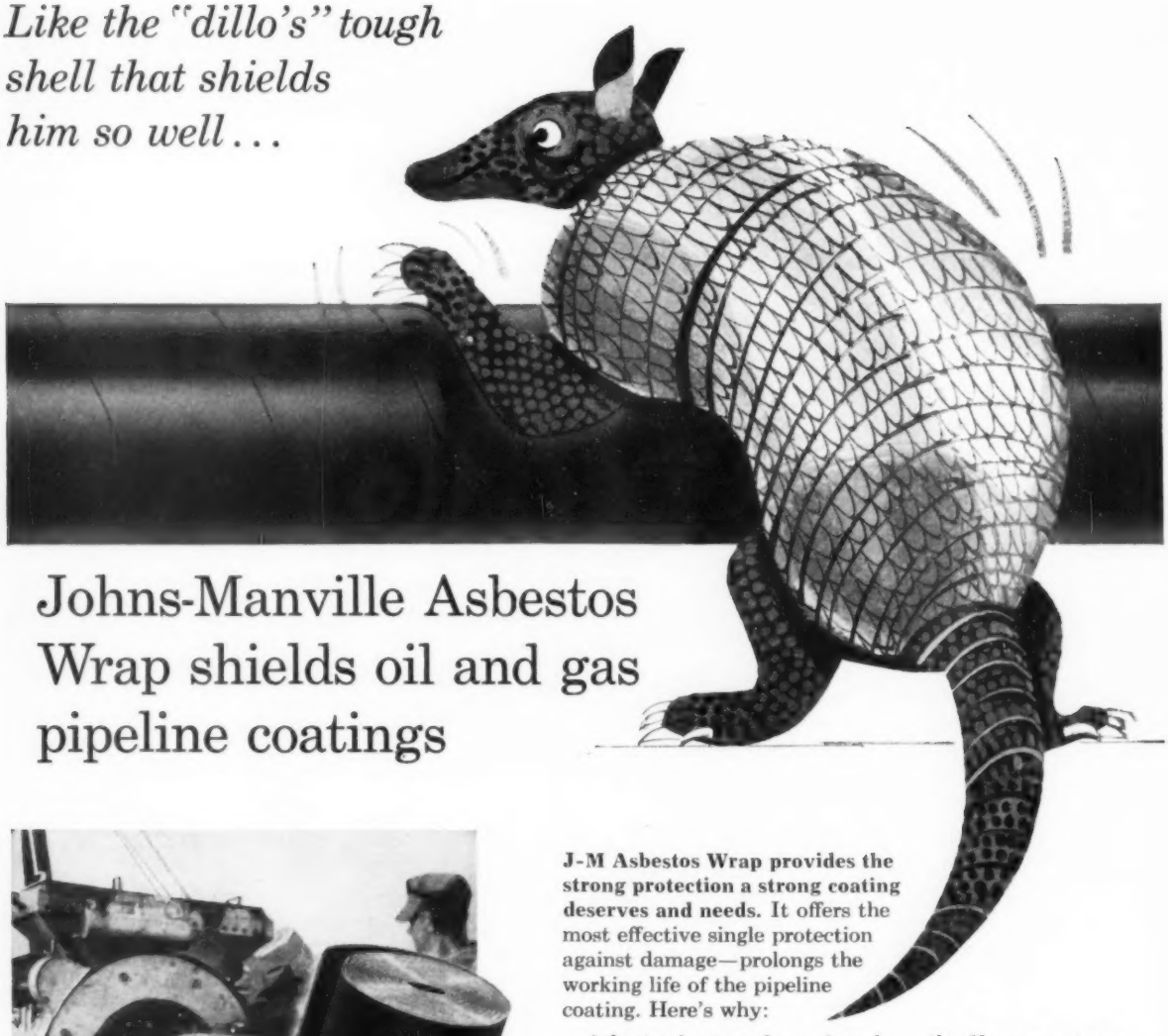

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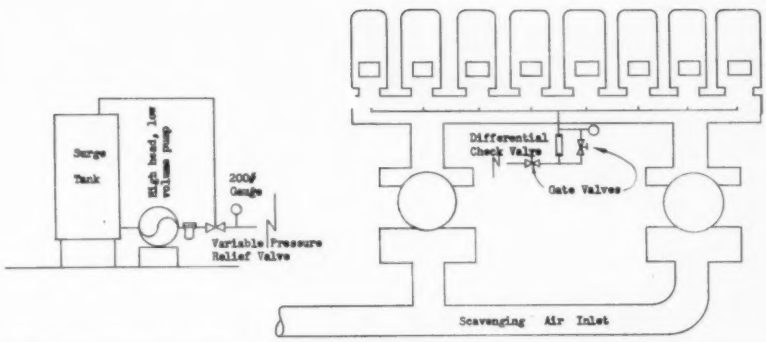
Fig. 3. A high head, low volume pump, variable back pressure valve and micro-filter were installed adjacent to engine room.

Fig. 4 (below). Typical water injection system.

distributed droplets of water rather than in the evaporated state.

Subsequently, it was noted that the relation of *moisture content* to final air stream temperature was considerably more uniform than was cooling efficiency to final temperature. In the case of the combination unit, the air stream temperature bisected the evaporative filter stream temperature at somewhat less than the temperature required for change of state at the elevated pressure. This difference then increased as the air streams progressed through the areas of flash temperature. From this it was apparent that change of state was occurring in most cases within the scavenging manifold and that we could expect the equivalent of an increase in manifold pressure which would serve to more efficiently scavenge the cylinders and also have a cooling effect on the internal walls.

This was our first clue to the suppression of detonation by moisture content rather than temperature depression of the scavenging air stream. Of even more interest, it appeared that we were showing a



significant decrease in Btu/bhp/hr.[1] If this were true, then a measurable difference in fuel efficiency should be effected by any seasonal change in natural atmospheric condition. A summary of the seasonal fuel use per horsepower versus moisture content for a period of 33 months validated this idea and convinced us that moisture addition during periods when detonation was not a problem would be consonant with improved fuel efficiency.

Extensive studies conducted by the aircraft industry in both water and water-alcohol injection had indicated favorable fuel economy and consistent detonation suppression. This was attributed to the phenomena of dissociation at elevated temperatures and pressures characterized by "reabsorption" of thermal energy. As the temperatures increased, a chemical equilibrium was reached wherein the dissociation equalled the burning reaction and no further increase in temperature obtained. This tended to "fatten" the upper portion of the indicator diagram with reflected increase in Bmep. Some recent studies at UCLA mention this phenomenon in connection with experimental water injection in automotive equipment to lessen the production of "smog" irritants.

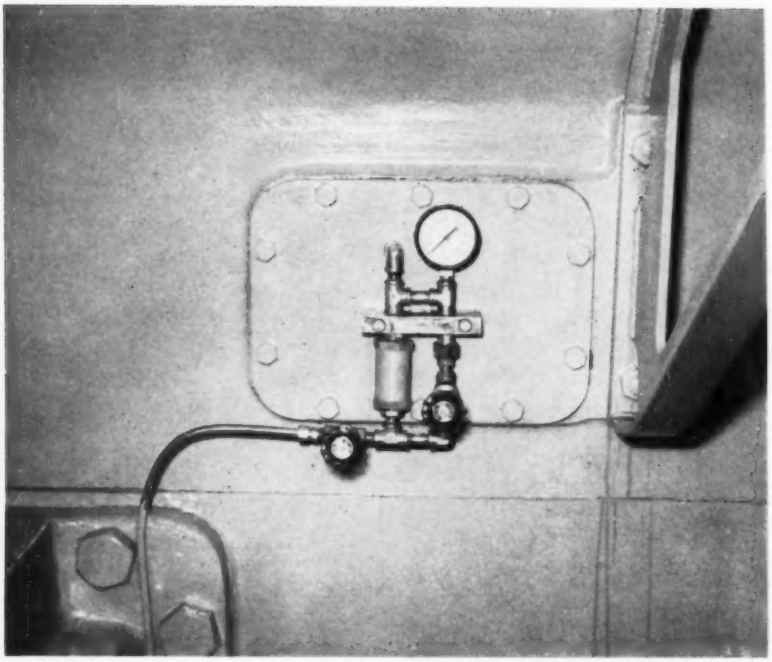


Fig. 5. No-flow differential check valve was installed at engine manifold assembly to prevent flooding engine crankcase in case of internal piping failure.

Having established that the new equipment was certainly not an evaporative cooler in the sense of the original machine, there was little purpose in any elaborate construction to provide simple moisture application.

A ½-in. copper header was mounted in the scavenging air manifold of one engine and equipped with eight atomizing spray heads, each of which was installed directly below the inlet to a power cylinder. This equipment was operated for 20 hours "wet" and 20 hours "dry." The results are shown in *Tables 1* and *2*, and again the effectiveness of moisture content without regard to inlet air temperature depression was substantiated.

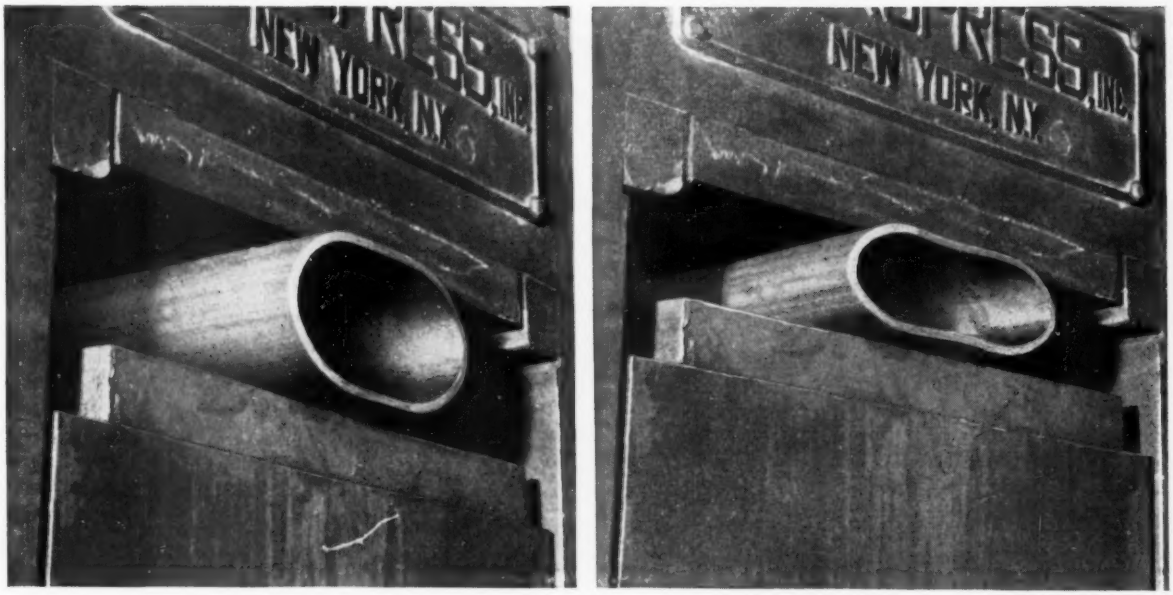
A 30-day test was then made, and at the end of the month, the power side was disassembled for inspection of the pistons, cylinders and rings. No unusual condition was noted except that there appeared to be considerably less car-

WATER INJECTION #2 BA3
September 1, 1956

Time	Corrected Fuel Use	H.P.	CuFt/HP	Injection Mfr. Press.	M.C. Lbs/Min.	Dry Bulb	Wet Bulb	R.H.	Pyro.#5	Duct Press "Hg.	Scav. Temp.	Duct Temp.	Butterfly Temp.	Cylinder Temp.	Remarks
9 AM	16267	1650	9.859	Off	4.48	85	67	.40	740	7.0	156	162	185	315	
10	16128	1655	9.745		4.81	91	70	.35	740	7.0	159	165	185	320	
11	16163	1640	9.855		4.78	95	71	.30	740	7.0	165	168	190	325	Detonating at intervals 11:40 AM
12	16127	1635	9.864		4.62	100	72	.25	740	7.0	168	171	190	325	
1 PM	16168	1675	9.653		3.99	102	71	.22	760	7.0	174	177	200	335	Detonating regularly 1:00 PM
2	16334	1675	9.752		3.84	104	71	.18	770	7.0	175	178	200	340	" " 2:00 "
3	16472	1675	9.834		3.72	105	71	.18	780	7.0	176	179	200	345	" " 3:00 "
4	16686	1675	9.962		3.59	106	71	.17	780	7.0	176	180	200	345	" " 4:00 "
5	16476	1675	9.836		3.47	104	70	.17	780	7.0	177	180	200	345	Detonating at intervals 5:00 PM
6	16400	1675	9.791		3.99	102	71	.22	780	7.0	176	180	195	343	
7	16094	1675	9.608		5.05	93	71	.34	770	7.0	170	174	195	335	
8	16203	1675	9.673		5.10	86	69	.42	780	7.0	164	170	193	333	Very little detonation 8:00 PM
9	16328	1688	9.673		4.51	82	66	.42	780	7.0	160	167	189	330	
10	16267	1697	9.586		4.25	82	65	.40	750	7.0	159	166	187	328	Detonation stopped 10:00 PM
11	16285	1655	9.840		4.68	78	65	.50	760	7.2	158	165	189	330	
12	16182	1655	9.778		4.30	76	63	.50	730	7.2	155	162	184	325	
1 AM	16223	1662	9.761		4.30	76	63	.50	735	7.2	155	162	184	328	
2	16267	1670	9.741		4.21	71	61	.57	740	7.3	150	158	180	325	
3	16228	1673	9.700		4.08	70	60	.55	735	7.3	150	158	180	325	
4	16248	1679	9.677		4.08	70	60	.55	760	7.3	149	158	180	325	
5	16330	1684	9.697		3.02	74	58	.37	740	7.3	148	156	178	321	
Average:		1669	9.756		4.23			.36						331	

TABLE 1. WATER INJECTION TEST NO. 1.

DUCTILITY



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bon buildup at the intake ports. Local hot-rod enthusiasts had led us to believe that this would be the case since water was known to blow carbon is cases of leaking head-to-jacket gaskets.

Summarizing our tests and observations, we were convinced that we could effectively produce conditioning sufficient to prevent detonation by application of a controllable quantity of moisture to the air stream; we would experience the equivalent of an increase in manifold pressure if the change of state occurred within this area; we should benefit from any advantage realized by the endothermic reaction of dissociation in increased power output and improved fuel efficiency, and enjoy such "fringe benefits" as minimizing and/or removing carbon buildup in the intake ports.

A high head, low volume pump, variable back pressure valve and micro-filter (*Fig. 3*) were installed adjacent to the engine room, and the copper discharge header extended to each of the ten engines. Each engine was equipped with a ½-in. copper manifold located within the scavenging air duct. Jewelled orifice fog nozzles capable of .3 to .5 lb per minute were attached to the headers at the scavenging air inlet of each of the power cylinders (*Fig. 4*).

Flexibility of volume was accomplished by varying the pressure to the jewelled orifices within the design characteristics of the nozzle. A no-flow differential check valve (*Fig. 5*) was installed at the engine manifold assembly to prevent flooding the engine crankcase in case of failure of the internal piping.

We started our ten engine test, and after a few days operation, began experiencing a rash of plug fouling which examination disclosed to be of a rusty carbon appearance. It was observed that the plugs on the four units which had most recently been overhauled and cleaned were not fouling.

Since our examination of the ports on the remaining units had established that we were removing carbon and that the plugs on these units were fouling excessively, we removed all engines from water injection except these four, and our plug traffic returned to normal, non-injection operation experience. No damage or erosion of the plugs occurred, but continuous removal, cleaning and replacement prompted us to withhold injection until, and as, overhaul and cleaning are completed.

So far, we have five engines operating satisfactorily on water injection, and by summer will have completed overhaul on the remaining five. ■

1. Pacific Coast Gas Association Proceedings, 1955.

This article is adapted from a paper presented at the joint AGA-PCGA transmission conference held in San Francisco, May 8-10.

WATER INJECTION #2 BAS
September 2, 1956

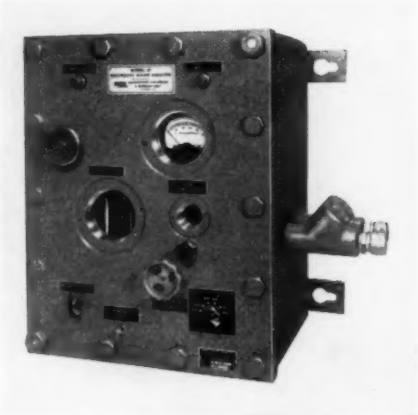
Time	Corrected Fuel Use	H.P.	CuFt/HP	Injection Hdr. Press.	M.C. Lbs./Min.	Dry Bulb	Wet Bulb	R.H.	Pyro. #5	Duct Press. "Hg.	Scav. Temp.	Duct Temp.	Butterfly Temp.	Cylinder Temp.	Remarks
9 AM	16307	1620	-----	73	6.50	85	63	.28	730	7.0	159	119	150	195	
10	16087	1695	9.490	72	7.10	91	67	.28	730	7.0	160	120	155	200	
11	16308	1730	9.427	72	7.10	97	69	.24	740	7.0	165	122	160	206	
12	16307	1690	9.649	72	7.30	101	71	.22	740	7.0	171	123	165	212	
1 PM	16406	1725	9.511	72	6.77	104	70	.17	740	6.8	172	123	170	215	
2	15975	1665	9.595	72	7.25	106	72	.18	740	6.8	176	124	175	225	
3	15832	1725	9.178	72	7.00	108	72	.17	740	6.8	175	127	175	223	
4	16187	1720	9.411	72	7.00	108	72	.17	730	6.8	174	128	175	223	
5	16231	1725	9.409	72	7.00	108	72	.17	740	6.8	174	128	170	222	
6	16241	1725	9.415	72	7.62	105	73	.21	740	6.8	174	128	170	225	
7	16316	1725	9.459	72	8.20	97	72	.30	740	6.8	172	128	170	228	
8	15880	1725	9.206	73	8.24	90	70	.37	745	6.9	165	126	167	230	
9	16101	1722	9.350	73	8.64	86	70	.45	760	7.1	164	123	167	231	
10	16075	1716	9.368	73	8.31	83	68	.45	760	7.1	163	122	167	232	
11	16127	1705	9.459	73	8.60	78	67	.57	740	7.2	158	122	164	220	
12	16172	1720	9.402	73	8.09	80	66	.48	730	7.3	148	118	165	225	
1 AM	16293	1712	9.517	73	7.86	76	64	.53	730	7.4	150	118	164	225	
2	16251	1736	9.361	73	7.86	76	64	.53	730	7.3	150	118	160	225	
3	16340	1750	9.337	73	7.53	76	63	.48	740	7.4	151	118	162	220	
4	16293	1714	9.506	73	6.94	79	62	.38	720	7.4	150	116	162	220	At end of test, water was shut off and serious detonation occurred immediately at 1750-1760 HP.
5	16406	1748	9.386	73	6.98	73	60	.48	730	7.3	149	116	162	222	
Average:		1714	9.422		7.52			.34						220	

TABLE 2. WATER INJECTION TEST NO. 2.

Which of these Model W ELECTROLYTIC MOISTURE ANALYZERS do you need?

STANDARD UNIT

Shown with Model A Oil Separator and Model I Vaporizing Valve mounted on side panel.



EXPLOSION-PROOF UNIT

Available with or without thermostatic controls.

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Instruments for automatic control of moisture content of gases are also available.

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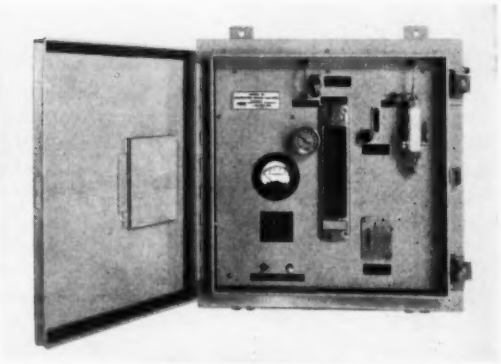
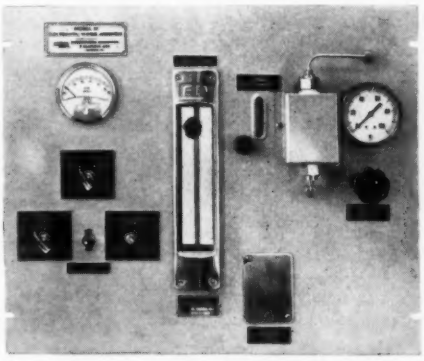
Write us today for complete information on the model that is best suited for your own particular purpose.



WEATHER-PROOF UNIT

For fixed or portable installation — available with or without thermostatic controls and insulation. Battery operation optional.



TYPICAL RELAY RACK PANEL UNIT

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"To supply a big area like Los Angeles, you have to react fast in case of a load change or pressure drop," says W. H. Krammes, chief of central transmission.

"When our stations were attended, we'd often have a ten-minute lag between a dispatcher's order and its execution. The station attendant would have to run back and forth checking meters, then relay the readings to the dispatcher.

"Today, with Bell System channels for remote metering and control, it's practically instantaneous. The dispatcher reads the telemeter, pushes a button and valves are operated at the remote station."

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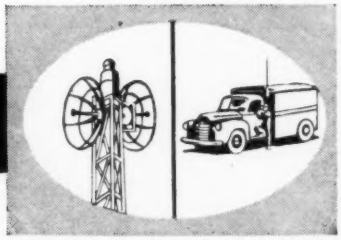

By FRANK CHAPMAN

More than 200 witnesses testify in microwave case

MOST of the arguments on future allocation of microwave frequencies (890 mc and above) are now before the Federal Communications Commission. The foundations for the rules and regulations which will govern gas industry use of this important communications tool have been laid in the often-conflicting testimony of over 200 witnesses.

FCC officials now must select which of the opposing arguments they will use as pillars on which to rest new microwave rules and regulations governing allocation and use.

Final witness in the direct phase of the microwave hearings, the Radio Electronics-Television Manufacturers Association, will appear before the commission early in September—after FCC's usual August recess. Later in the fall, the commission may schedule a few days of supplementary hearings to clear up conflicting points presented by some of the witnesses.

Following that, the drawn out process of reshaping microwave rules will begin. FCC spokesmen expect that the final order in the series on microwave frequencies will be issued in mid-1958, or later.

Some of the controversy expected between the natural gas and petroleum industry and the communications common carriers (American Telephone and Telegraph, Western Union, and others) failed to materialize. But the common carriers made it clear in private talks and by inference in testimony that it was with a great deal of reluctance that they did not oppose gas-petroleum industry pipeline usage and demand almost complete control of the microwave bands.

One explanation for the relatively moderate official stand of the common carriers may have been letters from the Attorney General to the FCC warning that any grant of monopoly powers in microwave to AT&T or other carriers would be considered a violation of the antitrust laws and court decisions which still are actively exercising control over the communications utilities.

For the gas industry, the hearings were a chance to insist that its present position in the microwave bands be maintained without change, and that frequency sharing be used only when it is done voluntarily.

For the common carriers, however, it was a chance to argue again that they, and they alone, are best equipped to take care of all communications needs for the entire country. Concessions that some industries might need to operate their own communications systems were grudgingly made and without much conviction by the carriers.

Officially, the carriers denied that they wanted to take over the microwave system. Many gas industry men weren't convinced.

E. T. Lockwood, assistant vice president of the American Telephone and Telegraph Co., set the tone of the carrier position. He strongly opposed unlimited licensing of private microwave systems for general business and industrial purposes.

"Such a policy," he said, "would not only be wasteful of communications facilities and manpower, but would adversely affect the common carrier communications service upon which the nation depends so largely for its defense as well as its economic and social life."

Private microwave facilities for public safety agencies and right-of-way companies, such as gas and oil pipelines, were not directly opposed. The special communications needs of these types of operations "may well be justified by the special conditions inherent in these undertakings," he conceded.

"Those who bear primary responsibility for the public safety (including right-of-way companies) should have wide latitude in the choice of communications facilities and services required to protect life and property," he said. He added that in many cases, right-of-

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way companies must "traverse remote and sparsely populated areas and the operation of their plant requires communication not only between major terminal points, but also between numerous way stations."

After making these statements, however, he added that the Bell Telephone companies "are convinced that the common carriers can meet most of the communications requirements of these organizations."

But, he said, the common carriers do not oppose allocation of frequencies to these organizations "where frequencies are used to meet special operational requirements."

It is the last phrase, "special operational requirements," that led to suggestions that operation of private microwave frequencies, where granted, be strictly controlled. Interconnection between private radio systems and the common carrier telephone systems should be banned; sharing of a system between several firms should not be permitted, and licenses should not be granted for purely economic reasons, spokesmen insisted.

Principal point in the common carriers' argument was that if private microwave systems were freely licensed, firms would use them to where it was profitable to do so, but continue to use commercial communications services over rough areas or in spots where it would be too expensive. This could be done, AT&T officials said, because the common carriers charge the same rate regardless of the cost of service over a particular line—some lines make money, others lose money.

Result of permitting private firms to take the "milk run" communications lines over and force commercial communications to continue on the most costly ones, would be higher prices for the small users, they argued.

They also stressed in testimony the economic need for the FCC to maintain the country's communications network in sound fiscal shape.

Another Bell spokesman testified that in 1956, some 10.5 million intercity telephone circuit miles of microwave were in use, representing some 22 per cent of all telephone circuits. By the end of 1962,

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this figure will be close to 35 million circuit miles, and five years later, will pass the 70-million mile mark.

Bell asked for additional frequencies for common carriers "to insure meeting these requirements." At present, the bands allocated to common carriers, and often shared, are 3700-4200 mc; 5925-6425 mc, and 10700-11700 mc.

Bell asked exclusive common carrier allocations in the following bands: 890-940 mc; 3500-3700 mc; 6425-6575 mc; 10550-10700 mc; 11700-12200 mc; 12700-12875 mc; 16000-17850 mc, and 26000-30000 mc, as well as those used at present.

Temper of the common carrier officials, although not disclosed in public, is that pipelines, distributors, and other industrial and business firms should "stick to their knitting and let us run the communications business."

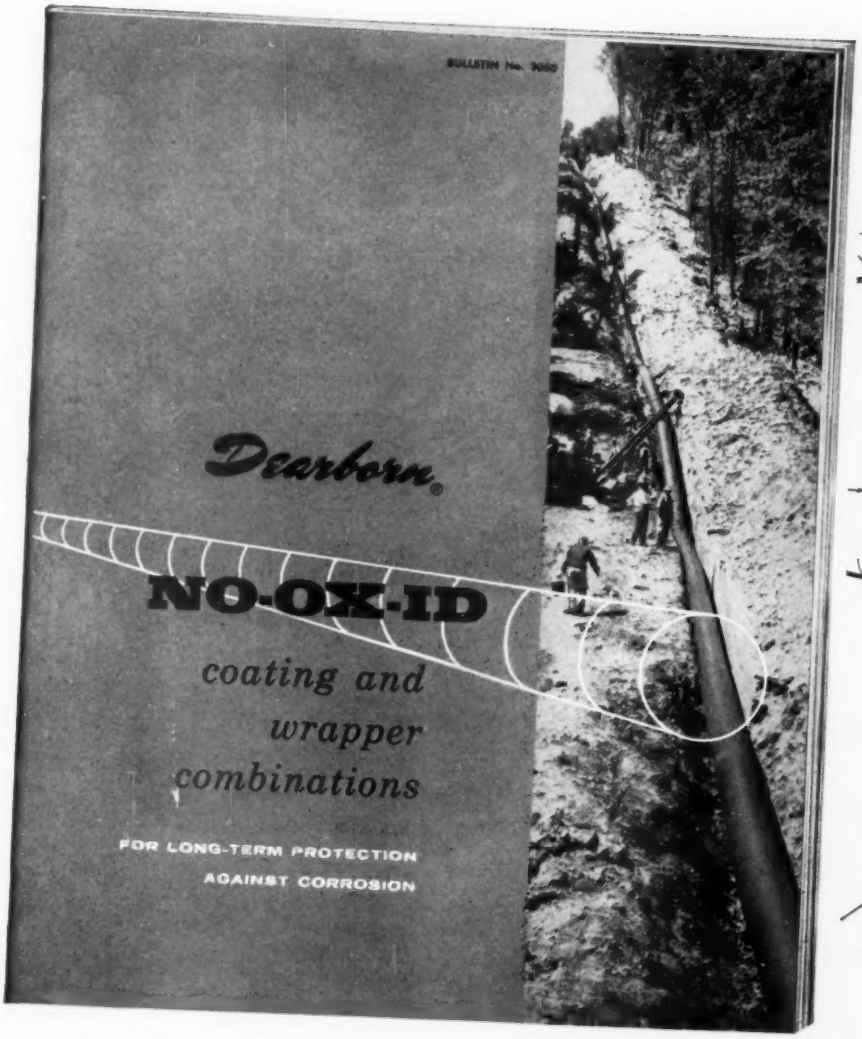
Some score of witnesses appeared at the hearings as spokesmen for the gas industry or of the combined gas-petroleum industry.

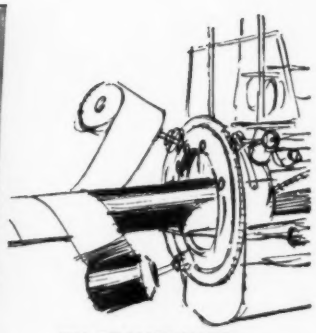
C. E. Upson, chairman of the communications committee of the American Gas Association, keynoted the gas industry views.

Mr. Upson, general superintendent of Texas Illinois Natural Gas Pipeline Co., Chicago, and two subsidiaries, Natural Gas Pipeline Co. of America and Natural Gas Storage Co. of Illinois, noted that two types of microwave radio facilities are used in the industry: 1. Petroleum Radio Service, which serves firms in seeking, producing, collecting and transporting natural gas by pipelines, and 2. Power Radio Service, which services firms engaged in distribution of gas.

He stresses that in order to protect the health and safety of the gas industry's 30 million customers, the industry must have adequate communication facilities. In order to fill its needs for a complete, reliable and flexible communications system, designed to fit the specific needs of the industry and be under the control of gas firms, microwave was developed and adopted as the standard method of intrasystem communications, he said.

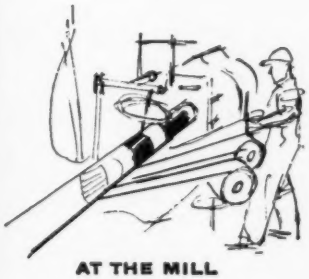
The gas industry, Mr. Upson told the commission, now operates some 11,000 route miles of microwave facilities providing about 76,000 channel miles of communication





BY TRAVELINER

BY HAND



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service. There will be a need for between 26,000 and 39,000 additional route miles of microwave facilities to serve planned expansion over the next 10 years, he said.

H. A. Rhodes, superintendent of communications for Transcontinental Gas Pipe Line Corp., speaking for the American Petroleum Institute's Central Committee on Radio Facilities, detailed the industry position on sharing of frequencies.

"Sharing," he said, "will be desirable only where common carrier interests (between two or more firms) exist, and because of the highly competitive nature of the petroleum industry, sharing should be strictly on a voluntary basis and should not be made mandatory."

The industry, he added, does not favor sharing by cooperative arrangements whereby service is available to any eligible user on a rate basis. This type of service can best be provided by common carriers, Mr. Rhodes testified.

The Federal Communications Commission, when it gets around to deciding the microwave frequency allocation question, will have to do so without its long-time chairman, George C. McConnaughey.

Mr. McConnaughey, chairman of the FCC since 1954, resigned from the agency on June 30, when his appointment expired. The White House immediately named John C. Doerfer, a member of the commission since 1953, to head the body.

"No rule making any sharing arrangement mandatory should be adopted," he insisted. He also opposed regulations which would require the FCC in considering an application for private microwave licenses to take into account the availability of common carrier facilities. "It is essential that freedom of choice in communications be preserved to further the most efficient operations of the petroleum industry," he said.

He also contended that private use of microwave in the industry saves the common carriers money by not requiring them to erect facilities over remote and inaccessible areas, and argued that the industry does not adversely affect common carrier revenues by using private facilities. He supplied figures showing that 48 major petroleum firms spend $22 million a year more on common carrier services than on their private facilities.

The industry, Mr. Rhodes said, does not favor, nor need, interconnection between private and common carrier communications facilities. And the industry supports allocation of microwave frequencies in exclusive blocks, without any sharing of frequencies between private and common carrier systems.

Meanwhile, the FCC has delayed beginning a similar investigation of allocation and use policies in the lower frequencies, from 25 to 980 mc. Deadline for interested parties to file comments on the investigation has been extended to Sept. 6. Hearing dates thus won't be set until some time this fall. ■

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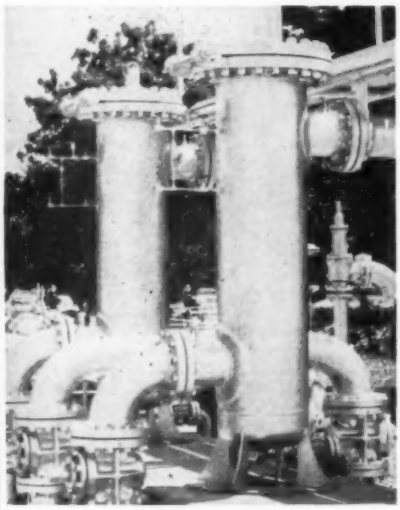

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YOU CAN DEPEND ON DOW

GAS pipeline news

Colorado wants to present new evidence in rate case

Pleas and counter-pleas are being heard in Washington as Colorado Interstate Gas Co. asks the FPC to set aside its recent rate decision.

CIG has asked the commission to set aside an examiner's decision disallowing approximately $20 million in rate increases. It wants the case reopened for presentation of additional evidence. Opposing the reopening of the case are representatives of the FPC staff, the Colorado Public Utilities Commission, the City and County of Denver, Citizens Utilities Co., and the City of Colorado Springs.

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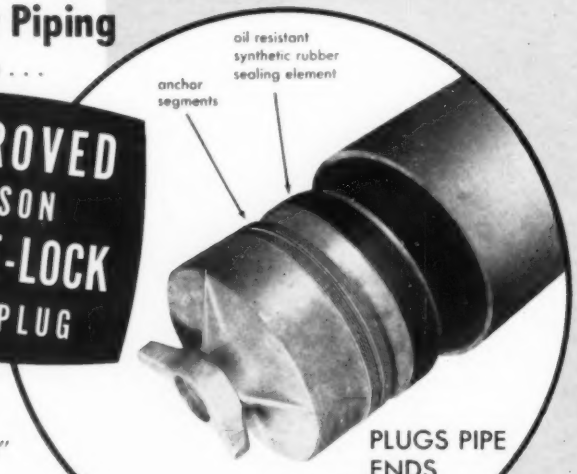

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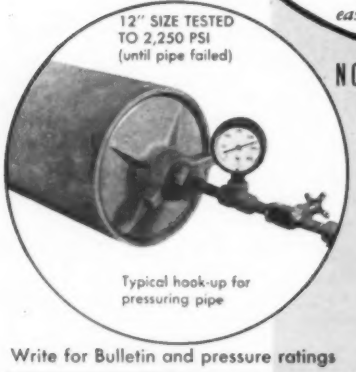

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FPC green-lights major part of Transco plan

Construction is progressing on Transcontinental Gas Pipe Line Corp.'s plan to bring more gas to the New York-New Jersey-Philadelphia metropolitan area.

The temporary certificate issued by the FPC (Docket G-12059) covers substantial portions of Transco's $54 million expansion. Included in the okayed portion: 247 miles of new purchase laterals, mostly 24- and 16-in. pipe, to reach new reserves in Texas; 57 miles of 36- and 30-in. mainline loops in Louisiana, Mississippi, Alabama, Georgia, and South Carolina; three new mainline compressor stations and additions to existing stations.

Transco completed a purchase lateral in mid-July which will enable the company to buy natural gas from several companies in the Block 45 area, offshore Cameron parish, La. Transco also for the first time is now buying gas from fields in Mississippi.

The new facilities are required to step up daily allocations this winter to the metropolitan area by more than 83 MMcf.

Northern arranges credit with 12 banks

Northern Natural Gas Co., Omaha, and 12 commercial banks have signed a credit agreement for temporary borrowings up to $36 million.

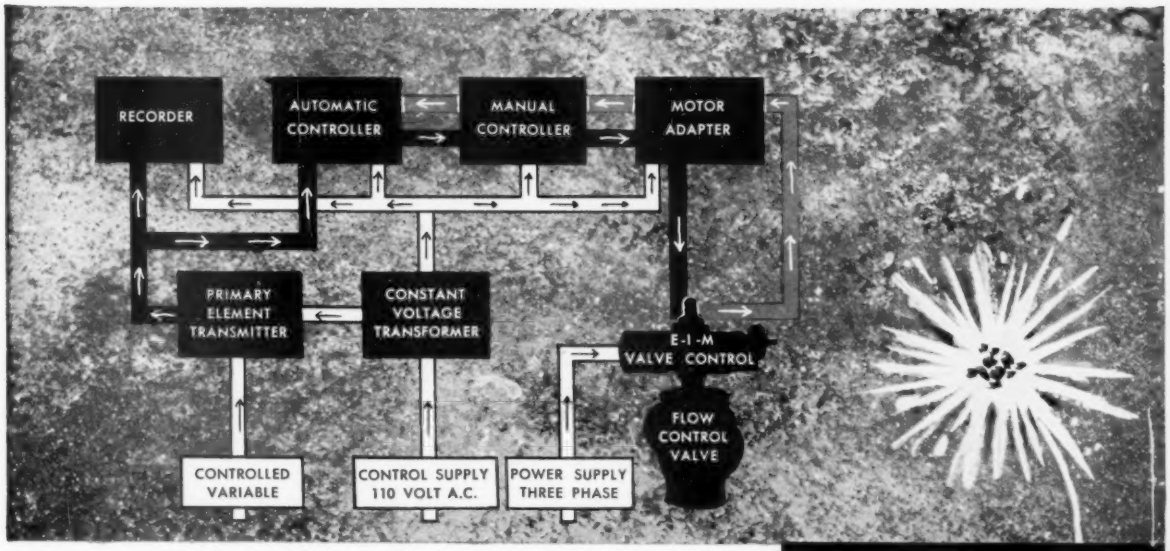
H. H. Siert, Northern treasurer, said the borrowings would be used to provide interim financing for 1957 construction programs of both Northern and its subsidiaries. The agreement, he reported, expires June 2, 1958. Northern has the privilege of prepaying loans and canceling the credit without a penalty.

Court declines to limit natural gas contracts

The U. S. Court of Appeals has declined to interfere with an FPC order permitting wholesale gas distributors to require long-term contracts from retail distributors.

Appeals had been filed by Cincinnati Gas & Power Co. and its subsidiary, Union Light, Heat &

(*Continued on page* 160)



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The fully flexible electronic control system, utilizing A.C., D.C., motion inputs as well as conventional primary elements, is highly suitable for process and power instrumentation.

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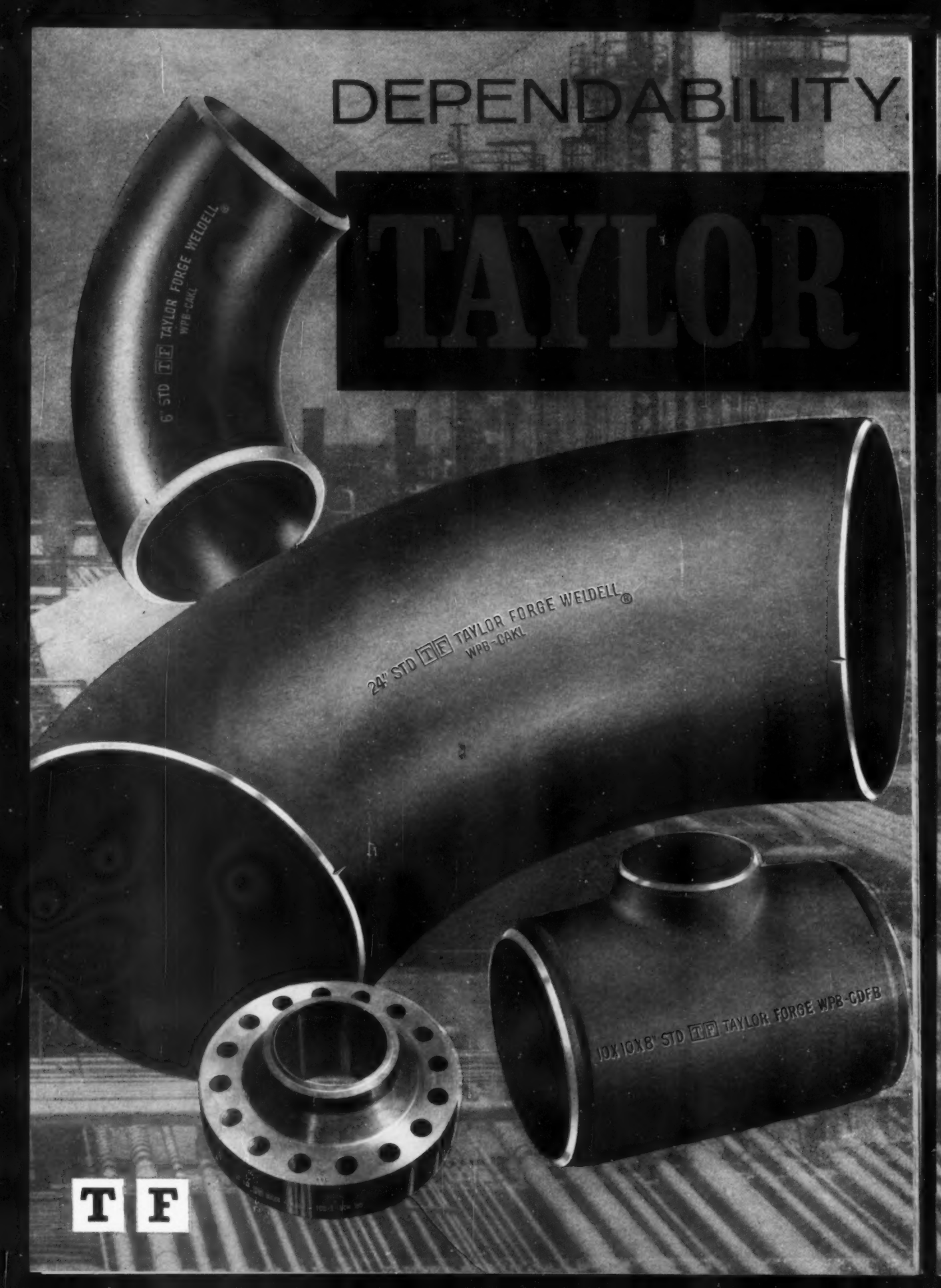
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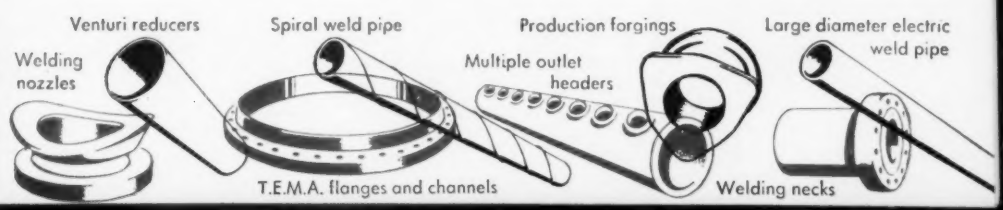

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Frozen ground . . . rocky soil . . . steep grades—wherever the going really gets rough, you've got a job for a BANTAM. For example, one pipeline contractor recently reported chopping a 5′ trench through 1350′ of hard soapstone in only 10 hours with a BANTAM back hoe.

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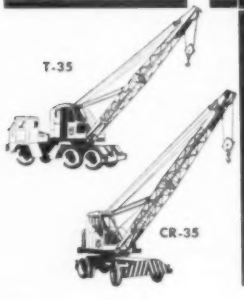

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pipeline news • *Cont'd.*

(*from page* 156)

Power Co., and by the Dayton Power & Light Co.

The appeals grew out of a commission order which permitted Central Kentucky Natural Gas Co. and its affiliated supplier, United Fuel Gas Co., to change their rate form so as to provide for a contract period of about 20 years.

Central Kentucky and United Fuel filed new tariffs providing for substantial increases in both demand and commodity charges, as well as long-term contract. The FPC, however, reserved for future hearing and consideration all issues concerning the new tariffs except the long-term contract.

Gas service proposed to new Colorado area

Colorado's Public Service Commission has approved construction of a 40-mile line to carry gas to the Rifle, Colo. area.

The new line, to cost $600,000, will be laid by Western Slope Gas Co., a wholly owned subsidiary of Public Service Co. of Colorado. The company has applied to the Rifle Town Board for a franchise to distribute natural gas there. Western Slope will invest an additional $70,000 to $80,000 on a system which will also serve the nearby Union Carbide Co. uranium mill.

New Texas gathering system approved

Pioneer Gathering System Inc., subsidiary of Pioneer Natural Gas Co., Amarillo, has FPC authorization to build gathering facilities and sell gas in Val Verde, Sutton, and Schelicher counties, Texas.

Some 70 miles of pipeline and one compressor station will be built at a cost of $4.5 million. Most of the materials were on hand when the okay was received, so construction is under way and completion is slated for early fall.

Permian Basin Pipeline Co. has contracted to purchase up to 200 MMcf/day. Initial deliveries from the new system are expected to be about 60 to 70 MMcf/day.

Humble enlarging gathering facilities

Humble Oil & Refining Co. will spend up to $75 million during the next two years to enlarge its natu-

(*Continued on page* 164)

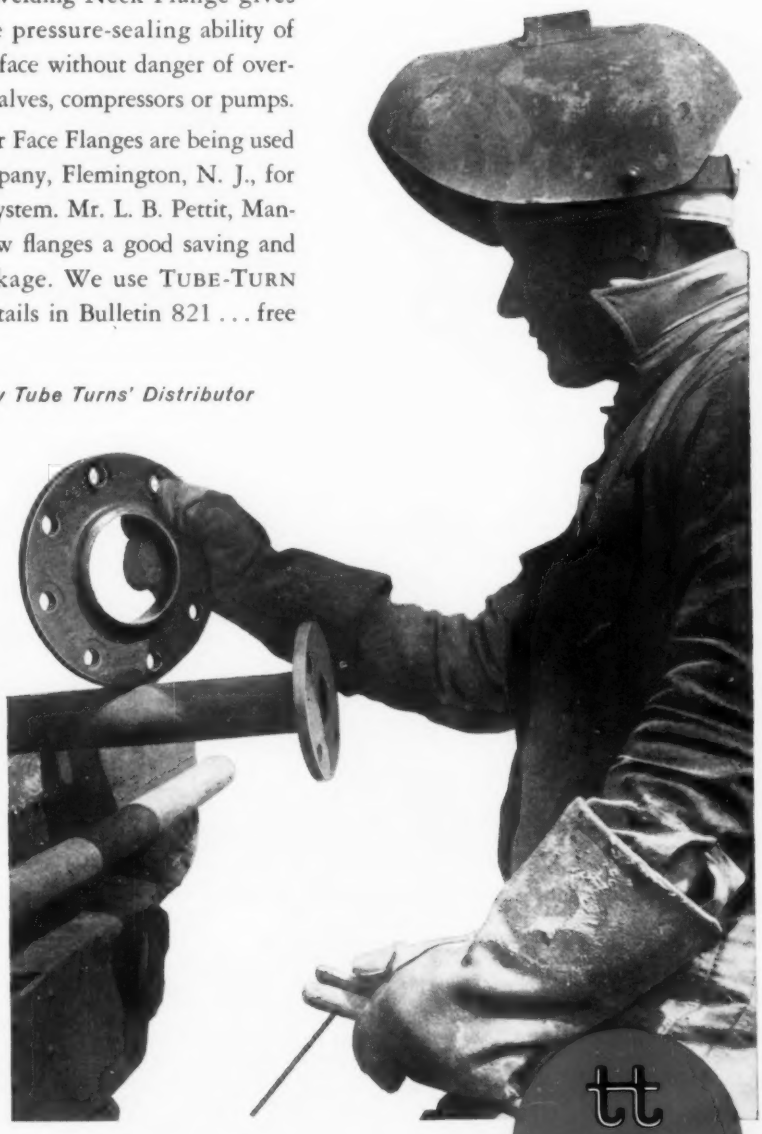
Insure against valve damage

with new TUBE-TURN Taper Face Flange

THE new TUBE-TURN* 125 lb. W.O.G. lightweight forged steel Taper Face Welding Neck Flange gives approximately three times the pressure-sealing ability of the same flange having a flat face without danger of overstressing cast iron flanges of valves, compressors or pumps.

The new TUBE-TURN Taper Face Flanges are being used by progressive City Gas Company, Flemington, N. J., for its fast-growing distribution system. Mr. L. B. Pettit, Manager, says: "We find these new flanges a good saving and good insurance against leakage. We use TUBE-TURN products exclusively." Full details in Bulletin 821 . . . free on request.

Available from your nearby Tube Turns' Distributor



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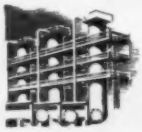
In the frozen north... Canada's first "BIG INCH"

WESTCOAST TRANSMISSION COMPANY is laying a 30 inch pipeline to tap the prolific gas resources of British Columbia and Alberta. This line runs from these fields due south to the international border. The 688-mile main line marks the first large-scale interchange of natural gas between western Canada's new and expanding fields and U. S. markets. A .O. Smith's Milwaukee mill supplied approximately 22% of the 30-in. pipe used on the project.

Northwest passage... new mileage for world's longest "crude line"

INTERPROVINCIAL PIPE LINE COMPANY has 1774 miles of main line now in service. They are extending this system another 156 miles during 1957. This big crude oil carrier extends from Edmonton, Alberta, to refineries in the Prairie Provinces and Ontario, in Minnesota, Wisconsin, and Michigan. Over 70% of the original line to Superior, Wisconsin, was supplied by A. O. Smith as well as most of the pipe for current and subsequent looping projects.

Want more facts about A. O. Smith products for the petroleum industry? Write today for free, illustrated brochure, "OIL"



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Gasoline dispensers, liquid meters

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Just about 30 years ago, A. O. Smith researchers developed the first truly practical method of mass-producing line pipe. *Result:* Pipelines, as we know them today, became economically feasible.

And A. O. Smith has kept the pace — with painstaking attention to quality in every production phase. This is the reason why A. O. Smith pipe, made and installed as far back as 1928, is still in operation today. This is the reason why you'll find A. O. Smith pipe in so many major high-pressure lines (including the four current projects pictured and described on these pages).

In the arid southwest... a river is pushed aside

To cross New Mexico's San Juan river, **EL PASO NATURAL GAS COMPANY** temporarily diverted the river . . . used dry-land pipelining methods. The new line will supply an additional 350,000,000 cubic feet daily to customers in California and 100,000,000 cubic feet more daily to customers in Arizona, New Mexico, Texas and Nevada. A. O. Smith Corporation of Texas mill supplied approximately 224 miles of 34-in. pipe for the project.

Underwater project..."MUSKRAT LINE" submarines toward completion

TENNESSEE GAS TRANSMISSION COMPANY'S 355-mile pipeline extension is laid underwater four-fifths of its length — traversing swamps and marshland. It will give the Tennessee gas system more than 9500 miles of line in 15 states, with average daily capacity of 1,800,000,000 cu. ft. A. O. Smith supplied the 18 and 20-inch pipe and a portion of the 24-in. pipe for the new extension.

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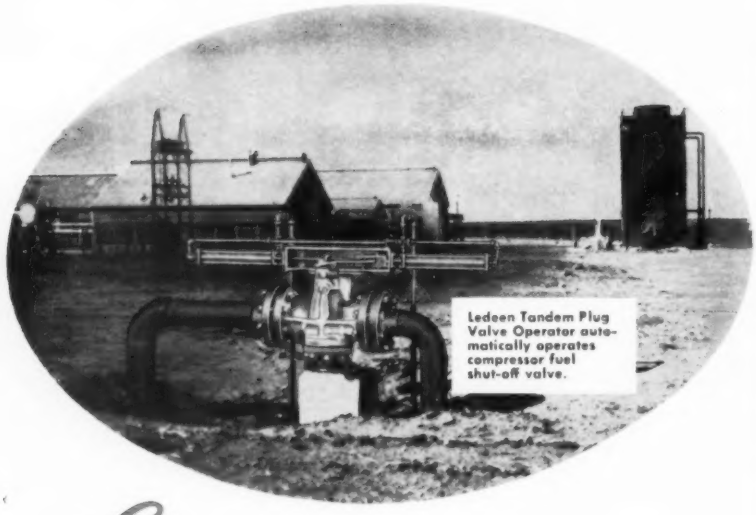

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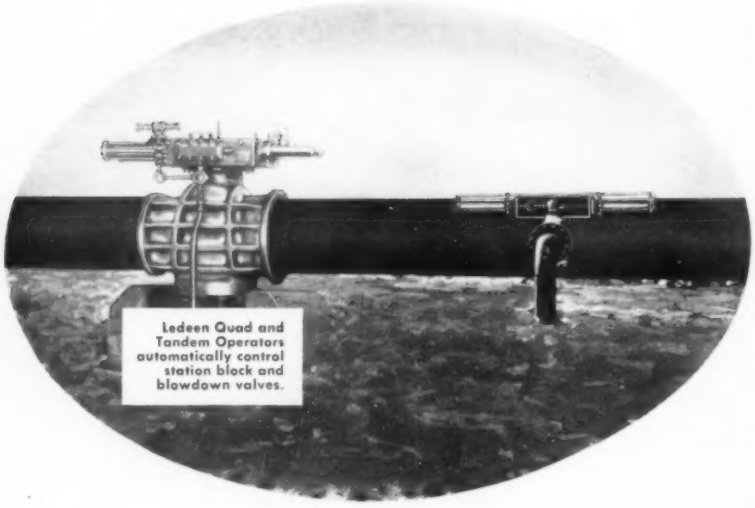
FOR THE GAS INDUSTRY



For automatic control of line valves, in typical installations as shown above, or for other applications in your own system, see Ledeen for one of the most complete lines of operators and controls available to the gas industry.

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WRITE FOR BULLETIN 3020

pipeline news • *Cont'd.*

ral gas gathering facilities in southwest Texas.

The program will include what is reportedly the world's largest gas processing and cycling plant, near Corpus Christi, and 450 miles of pipelines terminating in the Houston area. The plant will have a capacity of 750 MMcf/day.

El Paso moves to meet rising gas demands

Energy demands for the West Coast in 1966 will be an estimated 61 per cent above today's figure and natural gas must supply 35 per cent of the requirements. And, El Paso Natural's Paul Kayser says his company is now planning to deliver by 1960 more than 70 per cent of the 1966 requirements.

In an address before the New York Society of Security Analysts, Mr. Kayser announced that El Paso recently entered into new contracts to provide an additional 535 MMcf of gas per day to western customers—and the company has under contract, or in such state of negotiations that it is confident of attaining sufficient gas to meet these new demands.

Phillips Petroleum Co. has completed a deal with El Paso to assign rights to El Paso in all gas under approximately 53,000 acres in Beckham and Greer counties, Okla. In exchange, Phillips will receive an interest in El Paso's part of an oil concession in Venezuela.

Six gas wells have been completed by Phillips on its Beckham acreage. Initial potentials of the wells averaged about 1,650,000 cu ft/day.

Mountain Fuel extending Utah service area

Mountain Fuel Supply Co., Salt Lake City, has asked the Utah Public Service Commission for permission to extend its gas service north from Ogden to serve Logan and Brigham City.

If permission is granted, MFS will build a 12-in. line at a cost of $3.2 million this year. Eventually other communities in Cache and Box Elder counties will be attached to the line.

Coastal working on Texas-to-Florida line

Plans are moving ahead for the delivery of natural gas to the Florida area.

Both Houston Texas Gas & Oil

why this key compressor station works dependably despite these

temperature extremes

Compressor Station One is the key supply installation on the sprawling Pacific Northwest Pipeline system. Located at 6000 feet elevation near Ignacio, Colorado, the facilities boost pressure of nearly 300-million cubic feet of gas per day from the San Juan Basin gathering system. This station feeds a nearby gasoline plant before starting the gas on the long haul to the Pacific Northwest market.

In such a key spot, dependability is essential. Fish engineers carefully reviewed possible causes of trouble long before thoughts went into plans.

Extreme temperature fluctuations—from plus 100 degrees F. to minus 20 degrees F.—posed unusual problems. Under these conditions, reliable temperature control was difficult to achieve.

To be sure of providing efficient jacket water and lube oil temperatures under all extremes of ambient temperature and load, Fish designers elected to use unitized systems. Under this system, each engine has its own atmospheric cooler to take care of jacket water and lube oil cooling loads. A system of temperature control instruments was installed to provide very close control under all operating conditions. As designed, this remote station demonstrates extreme flexibility with reliability.

This is but one example of the type of advanced engineering you get from Fish. In addition, the same quality service prevails from feasibility study to project completion. If you are contemplating new or expanded facilities in oil, gas or chemicals, consult with Fish.

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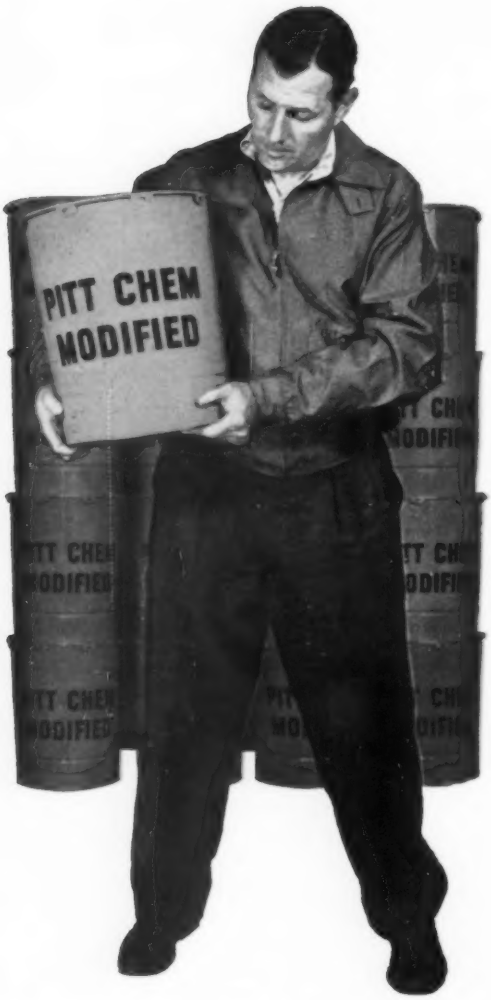

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- Smaller containers permit use of smaller melting kettle. In congested work areas, reduces space requirements for equipment.
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pipeline news • *Cont'd.*

Corp. and Coastal Transmission Corp. have completed placement of their first mortgage pipeline bonds in the total amount of $103.5 million, and Coastal has started construction of the first segment of the line in the gas supply area of south Texas.

The 20-year bonds bear interest at 5½ per cent and represent $65 million for the account of Houston and $38.5 million for Coastal.

Scheduled for September, however, is a hearing on the necessity of the line. A 3-judge division of the U. S. Court of Appeals said that final arguments of the Florida Economic Advisory Council's petition to set aside the FPC's approval of the line will be made by that time.

Off-shore deal okayed without rate condition

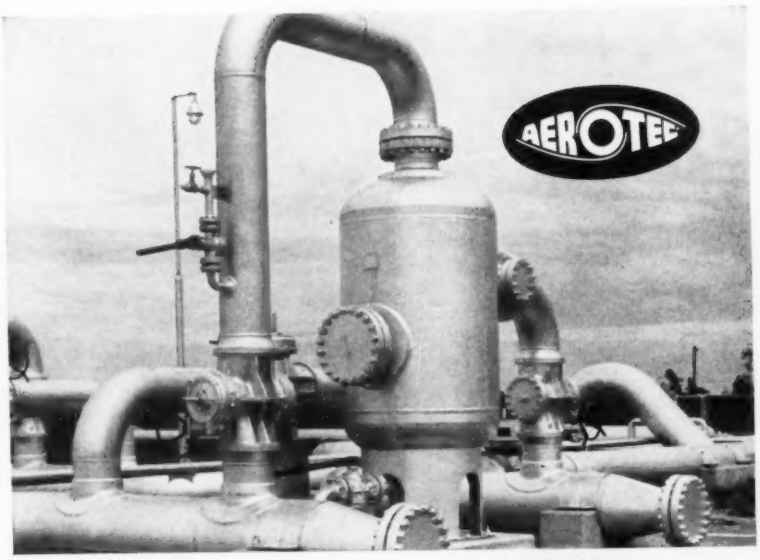
FPC has re-authorized the off-shore sale of gas to Tennessee Gas Transmission Co., this time without any condition affecting the initial price of the gas.

However, the initial rate of 21.4 cents/Mcf will be subject to "prompt investigation" as to its reasonableness. The producer group (CATCO) wouldn't accept the temporary certificate issued by the FPC in April. They asked the FPC to issue permanent certificates permitting them to charge the 21.4 cent initial rate. But, they agreed to amend their contracts to provide continuing supervision over future price increases in the event the Harris bill is enacted into law.

Minimum price law case before Supreme Court

The U. S. Supreme Court has agreed to review a case involving the state minimum price law. At issue is whether the Natural Gas Act deprives a state commission of jurisdiction to fix minimum wellhead prices for gas sold in interstate commerce.

The Kansas supreme court holds that the act does not deprive the Kansas Corporation Commission of jurisdiction to fix minimum wellhead prices for gas sold by producers to a natural gas company, either at the wellhead or in the field after production and gathering, for transportation and resale in interstate commerce, since the act specifically exempts "production . . . of natural gas."



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Gas Transmission or Distribution Line Scrubbers . . .

. . . Aerotec Dry Gas Scrubbers easily handle it without loss of efficiency.

Up to 100% overload can be handled by Aerotec Gas Scrubbers while still maintaining normal efficiency. Some of the features which contribute to the wide acceptance of these unique and outstanding scrubbers are:

Delivery of gas, free from dust and liquid carryover.

Small size for equivalent volumes as compared to conventional types.

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Contact our Project Engineers for information and aid on your gas cleaning problem.

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Manufacturers
THE AEROTEC CORPORATION
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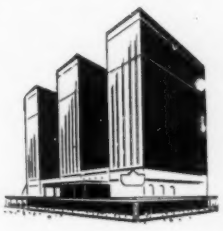
seasoned travelers prefer Houston's

RICE HOTEL

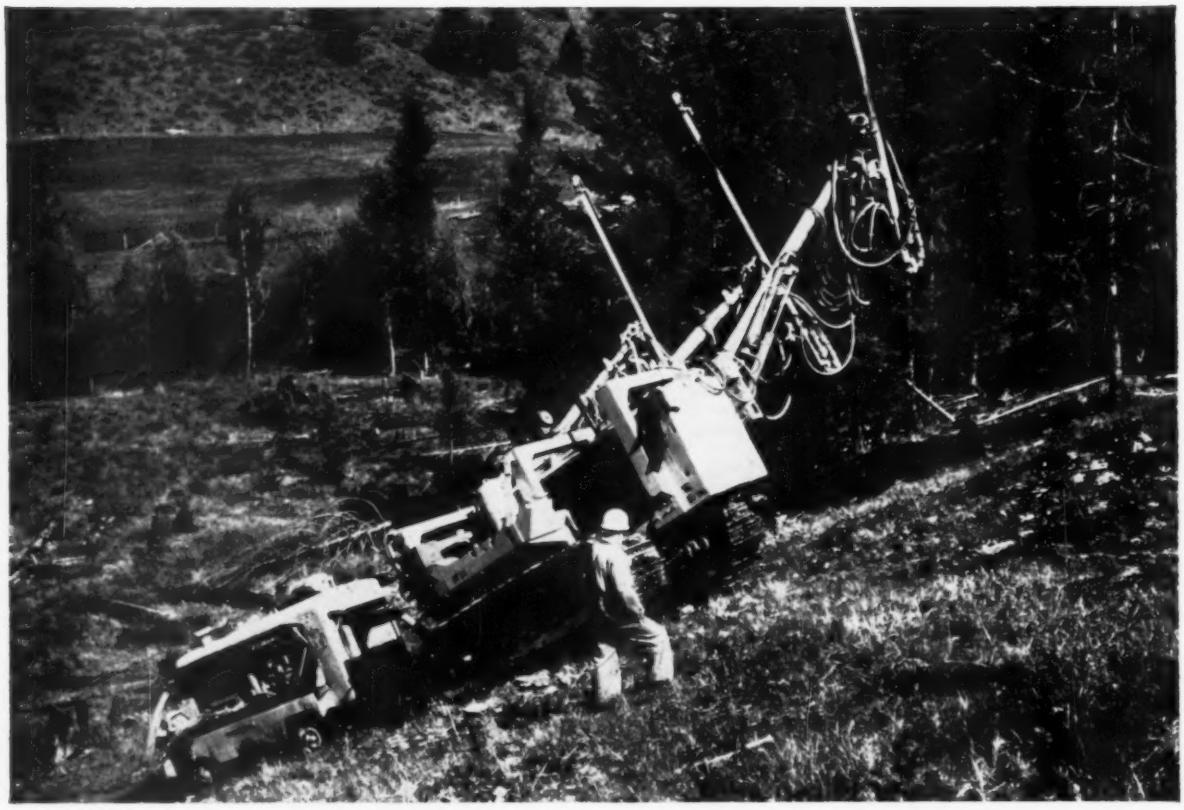


Heart of Houston location . . . 1,000 air conditioned rooms . . . three fine restaurants . . . rates from $5 single and $8 double. Convention facilities . . . unparalleled service.

Home of the fabulous new Petroleum Club

A COMPLETELY SELF-CONTAINED UNIT

FOR RAPID PIPE LINE TRENCH WORK



This tractor, equipped with a C-I-R multiple drilling rig, is towing its own compressor. A completely self-contained unit ready for the toughest terrain along the pipe line.

YOUR tractor can be equipped with whatever drilling rig you require—right in the field. C-I-R supplies specifications for proper mounting on all makes of tractors.

SERVICE and parts are readily available. A C-I-R representative is never far away.

CONTACT the Canadian Ingersoll-Rand office nearest to your operation for full details on how to equip your tractors right on the job.

Ask too about the PLM2 rigid frame Pipe Line Mounting, portable compressors, track mounted compressors, rock drilling equipment and carset jackbits.

Canadian Ingersoll-Rand Co. Limited

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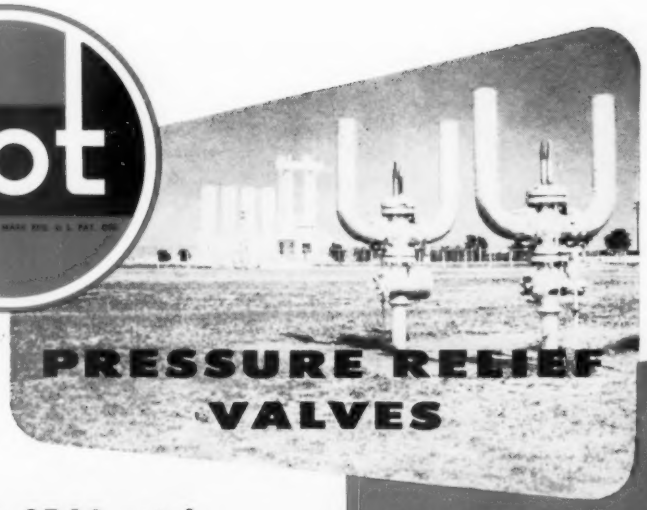


PRESSURE RELIEF VALVES

SOFT-SEAT SEAL with METAL-TO-METAL SUPPORT

Bubble-tight closure against gas or liquid **is assured by the soft seat design in GOT Pressure Relief Valves. Metal-to-metal support provided by the back-up ring allows a *calculated flow* of the resilient material. The clearance groove between the seat and disk is completely filled . . . the seal is *positive*, regardless of pressure.**

RESISTS ABRASION

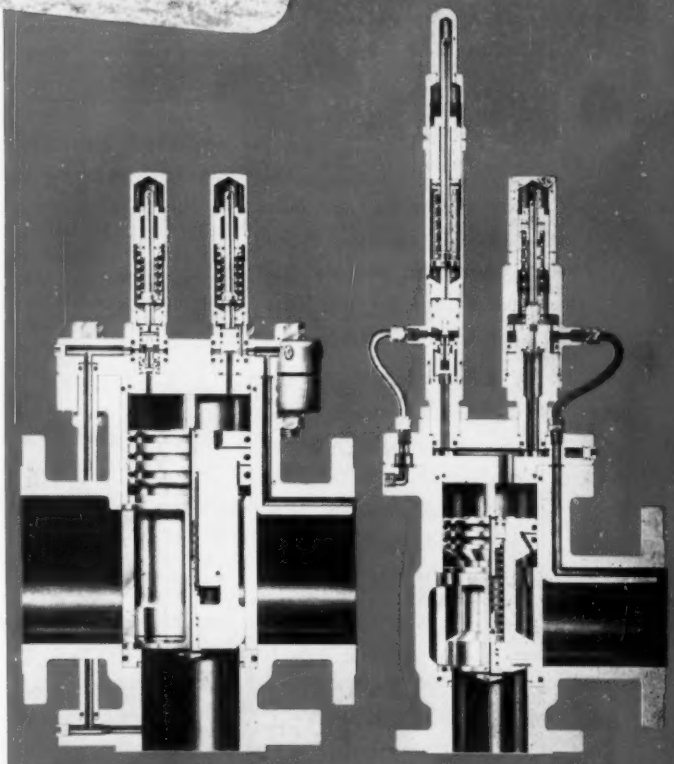
The sealing surface is protected from direct flow by the shrouding effect of the metal retainer. The *soft seat* withstands abrasion far better than the very hardest metal.

REDUCES MAINTENANCE

The sealing surface is on the top side of the seat, out of direct flow. No lapping or grinding of the seat is ever necessary. The disk is easily and quickly replaced in the field, without the need of special tools.

PROVED IN SERVICE

Hundreds of GOT Pressure Relief Valves with *soft seats* are in operation in liquid and gas service, operating at pressures from 15 psi to 1400 psi. Their performance has proved superior to any type of metal-to-metal seat valve . . . your assurance of greater safety and economy when you place them in service in your systems. For complete details, write for Catalog No. 556 RV.



TYPE "D" VALVE
Pressure range: 150 to 5000 psi

TYPE "E" VALVE
Pressure range: 15 to 200 psi

Garrett Relief Valves are furnished in a complete range of sizes, 1" through 8". Pressure range, 15 to 5000 psi.

Standard trim uses Monel or stainless steel in all critical areas. Stainless trim or special alloys available.

Garrett Oil Tools, Inc.
P. O. BOX 2427 • LONGVIEW, TEXAS

DIVISION OF USI U. S. INDUSTRIES, INC.
New York, N. Y.

To Canadian Users of

• *Leakage Control Surveys by*

HEATH

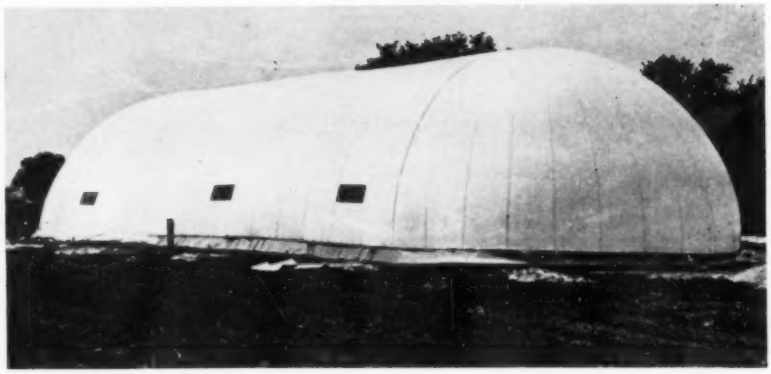
We have established an office and Canadian company in Sarnia, Ontario to provide best possible service for gas companies in Eastern Canada.

Heath Survey Consultants, Ltd. of Canada address in Sarnia is 196 North Christina Street. In addition, Heath Field Consultants in all Canadian provinces provide complete leakage control service throughout the year.

HEATH SURVEY CONSULTANTS, Ltd. of Canada
196 N. Christina St. Sarnia, Ontario

Write or wire collect for complete information about Heath Surveys to meet your requirements.

HEATH
Survey Consultants, Inc.
573 WASHINGTON STREET, WELLESLEY 81, MASS.



Tools, heavy equipment, battery charges, and miscellaneous items are stored by the pipeline division of Contracting & Material Co. in this air structure. The division is laying pipe near Chicago for Northern Illinois Gas Co.

Inflated building serves as temporary warehouse

The pipeline division of Contracting & Material Co. is using a temporary storage structure made of vinyl-coated nylon, inflated at the work site, to store tools, heavy equipment, battery charges, and miscellaneous equipment.

The division is laying a line near Chicago for Northern Illinois Gas Co.

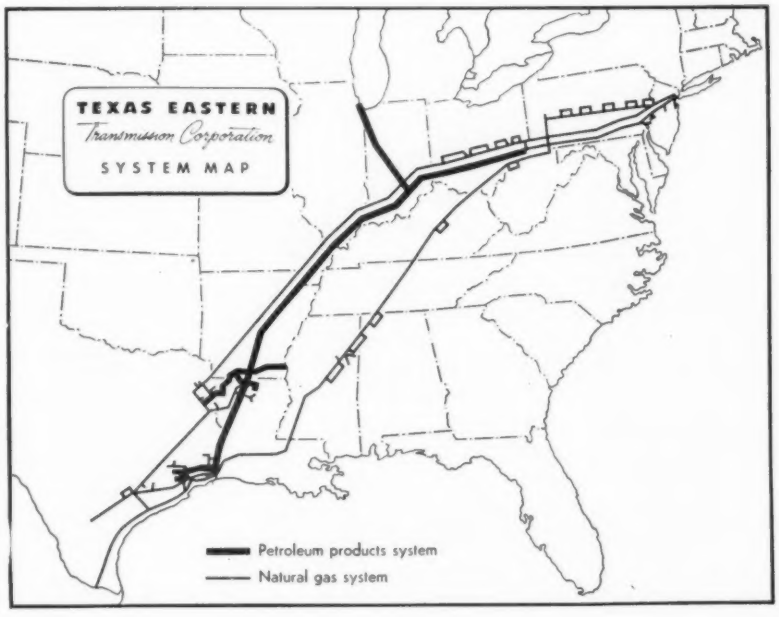
The 40x100x20-ft CID Air Structure is kept taut by a constant stream of low pressure air from a continuously operating blower. An air lock is installed, permitting flatbed trucks to drive into the warehouse without loss of pressure. There is also a personnel door in this air lock. The translucent fabric permits the entry of adequate daylight for usual storage activities within the structure.

This structure is erected on an earth floor. Sand ballast in the base of the structure holds it securely in place. This temporary warehouse was completely erected in approximately two and a half hours under the supervision of CID Air Structure Co., Chicago.

Texas Eastern's major projects approved

FPC has given the nod to Texas Eastern Transmission Corp.'s major expansion projects, including conversion of the Little Big Inch to petroleum products. Work on the reconversion project is expected to be completed in time for the line to begin operation in September.

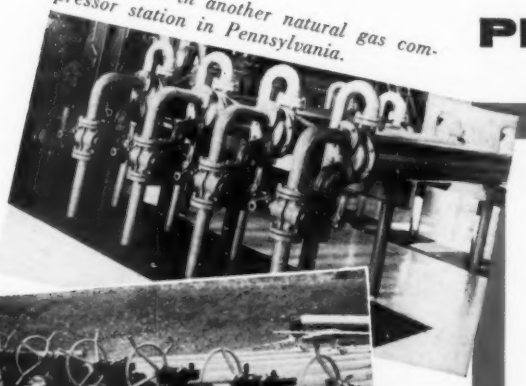
(*Continued on page* 174)



14 reasons why you get superior performance from acf

LUBRICATED PLUG VALVES

acf Valves in another natural gas compressor station in Pennsylvania.



Some of the 158 acf Valves in a Pennsylvania natural gas compressor plant. Working pressure ranges from 250 lbs. to 500 lbs.

1. Wide Port—Maximum Flow Efficiency
2. Full Pipe Area
3. Patented Head Gasket made of tough self-lubricating Teflon*
4. Perfectly lubricated (gun or stick)
5. Tight against head leaks under any line pressure
6. Minimum number of parts
7. Lubricant protects against wear and corrosion
8. No exposed seating surfaces
9. Quick opening
10. Installed in any position
11. Compact: fits into small space; gate valve face-to-face dimensions where needed
12. Non-wedging cylindrical plug provides easy operation
13. Easily dismantled for repairs
14. Lubricant release to prevent contamination

*DuPont's tetrafluoroethylene resin.

8704

Study this list of design and operating advantages and you will see why acf Lubricated Plug Valves are meeting the requirements of thousands of plants throughout the nation.

acf Valves permit your piping system to handle fluids with maximum efficiency at minimum cost in time, labor and power. Protected seating and sealing surfaces, leak-proof head seal, non-wedging plug reduce "down time" and maintenance to a minimum.

For higher efficiency—longer life—lower cost —specify acf Lubricated Plug Valves.

acf Valves are available in semi-steel, carbon steel, bronze and aluminum.

Sizes: ½" to 24".

Pressures: semi-steel; 175 lbs. WOG to 500 lbs. WOG.

Carbon steel: ASA 150 and ASA 300.

Representatives in all principal cities.

Ask your Industrial or Mill Supply Distributor for acf Valves.

W-K-M

DIVISION OF acf INDUSTRIES INCORPORATED

PLANT: MISSOURI CITY, TEXAS
MAILING ADDRESS: P. O. BOX 2117, HOUSTON, TEXAS

Write Dept. K-8 for new ACF Valve Catalog 400.

MANUFACTURERS OF W-K-M GATE VALVES acf LUBRICATED PLUG VALVES KEY-KAST ALLOY STEEL PIPING FITTINGS KEY RETURN BENDS AND FITTINGS

report of Cooper-Bessemer

Centrifugal Operation at Gulf Interstate . . .

Automation a Reality

in Gas Pipeline Transmission

Complete control — from 80 miles away — of an unattended main line compressor station . . . .

That's the story of Gulf Interstate's Stanton Station where their Cooper-Bessemer engine-driven centrifugal has now operated over 5500 hours. Here all operating functions such as starting, speed changing, shutting down and valving operations are automatically sequenced and under control of the remote operator.

Advantages of this new kind of set-up are many . . . . big savings in the cost of supervision, building and personnel housing . . . . centralized dispatching for improved system control and with fewer increments of control . . . . quicker adjustment to emergency and new operating conditions.

Cooper-Bessemer centrifugal compressors now meet a wide range of service requirements. Why not talk with the nearest Cooper-Bessemer office about your plans?

BRANCH OFFICES: Grove City • New York • Chicago
Washington • San Francisco • Los Angeles • Houston • Dallas
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Kansas City • Minneapolis • New Orleans • Shreveport • Casper

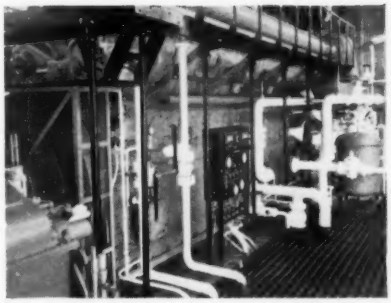
SUBSIDIARIES: Cooper-Bessemer of Canada, Limited . . .
Edmonton • Calgary • Halifax • Toronto.
Cooper-Bessemer International Corporation . . . New York
Caracas • Mexico City.

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN

With 41% thermal efficiency, this Cooper-Bessemer 4-cycle engine is unsurpassed in fuel economy by any other type of prime mover.



In Gulf Interstate's satellite station near Stanton, Kentucky, this Cooper-Bessemer centrifugal compressor is driven by a 4-cycle Cooper-Bessemer engine operating economically on natural gas from the pipeline.

pipeline news • *Cont'd.*

from page 170

The 1168-mile section scheduled for reconversion extends from Baytown, near Houston, to Moundsville, W. Va., and will connect with a 14-in. line the company is building from Seymour, Ind., to Chicago. Completion will establish the first major petroleum products common carrier pipeline link between the Gulf Coast and Mid-Continent refining areas and the fast growing midwestern market area.

The substitute gas facilities involve construction of 453 miles of 30-in. loops, addition of 42,300 compressor hp, and four new compressor stations.

When the reconversion program is complete, Texas Eastern will be operating approximately 1700 miles of pipeline and 61,500 pump horsepower in petroleum products service and some 5800 miles of pipe and 471,660 hp in natural gas service.

The FPC has also okayed plans of Texas Eastern and Texas Eastern Penn-Jersey Transmission Corp. to build facilities to add 110 MMcf/day to TET's transmission system. The $30.3 million project involves 67,610 hp of compression facilities and 137 miles of line.

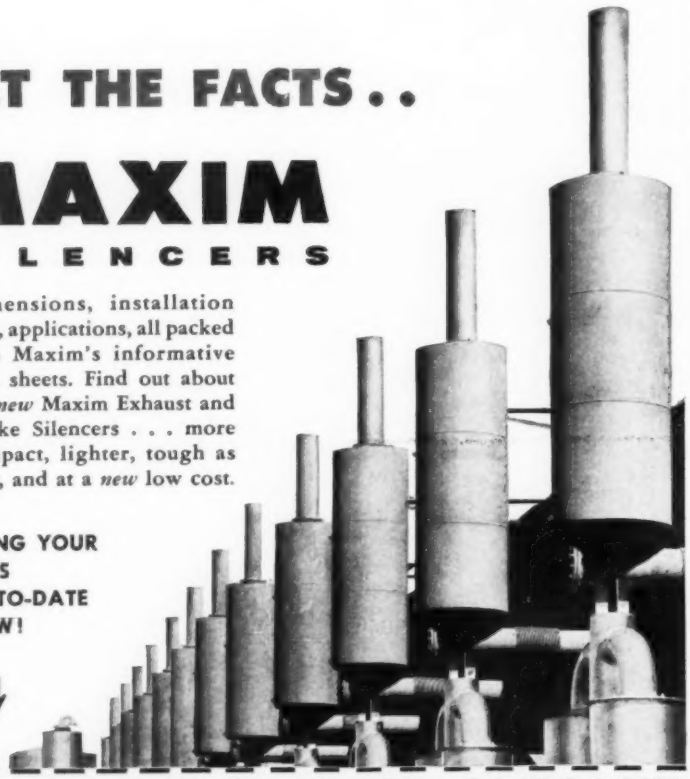
GET THE FACTS..

MAXIM

SILENCERS

Dimensions, installation data, applications, all packed into Maxim's informative data sheets. Find out about the *new* Maxim Exhaust and Intake Silencers . . . more compact, lighter, tough as ever, and at a *new* low cost.

BRING YOUR FILES UP-TO-DATE NOW!



THE MAXIM SILENCER COMPANY

Subsidiary of Emhart Manufacturing Company

95 Homestead Ave., Hartford, Conn.

Gentlemen: Please send bulletins on silencers for: ☐ WASTE HEAT RECOVERY

☐ INTERNAL COMBUSTION AND STEAM ENGINE EXHAUST AND INTAKE ☐ AIR COMPRESSOR INTAKES AND DISCHARGES ☐ VACUUM PUMP DISCHARGES

☐ BLOWER INTAKES AND DISCHARGES ☐ STEAM, AIR OR GAS DISCHARGES ☐ JET AIRPLANE ENGINE EXHAUST AND INTAKE

NAME _____

COMPANY _____

ADDRESS _____

Mainline looping okayed for Michigan-Wisconsin

Construction of two 11-mile segments by Michigan-Wisconsin Pipe Line Co. will result in the complete looping of the company's mainline serving Wisconsin. It will also provide a safety factor in the event of a line break.

Approved by the FPC (Docket G-12405) is 22 miles of 24-in. loop in Illinois and Wisconsin. Cost is estimated at $1.8 million.

Cities Service meeting increasing requirements

A 2700-hp addition at the Blackwell compressor station, 15 miles of 26-in. replacement line, and 6.5 miles of 30-in. replacement line are being built by Cities Service Gas Co., Oklahoma City (Docket G-10956).

The $2.1 million project in Oklahoma and Kansas will help Cities Service meet its increased peak day firm requirements to existing customers. This portion of the system serves the Kansas City area, where peak day firm demand will increase from 559,252 Mcf in 1956-57 to 629,314 Mcf by 1959-60.

United Fuel developing underground storage pool

Development of an underground gas storage pool in Kanawha county, W. Va. is being carried out by United Fuel Gas Co., Charleston, W. Va. Included in the plan is 3.3 miles of 16-in. line from United Fuel's Coco compressor station to interconnect with the field facilities in the storage pool.

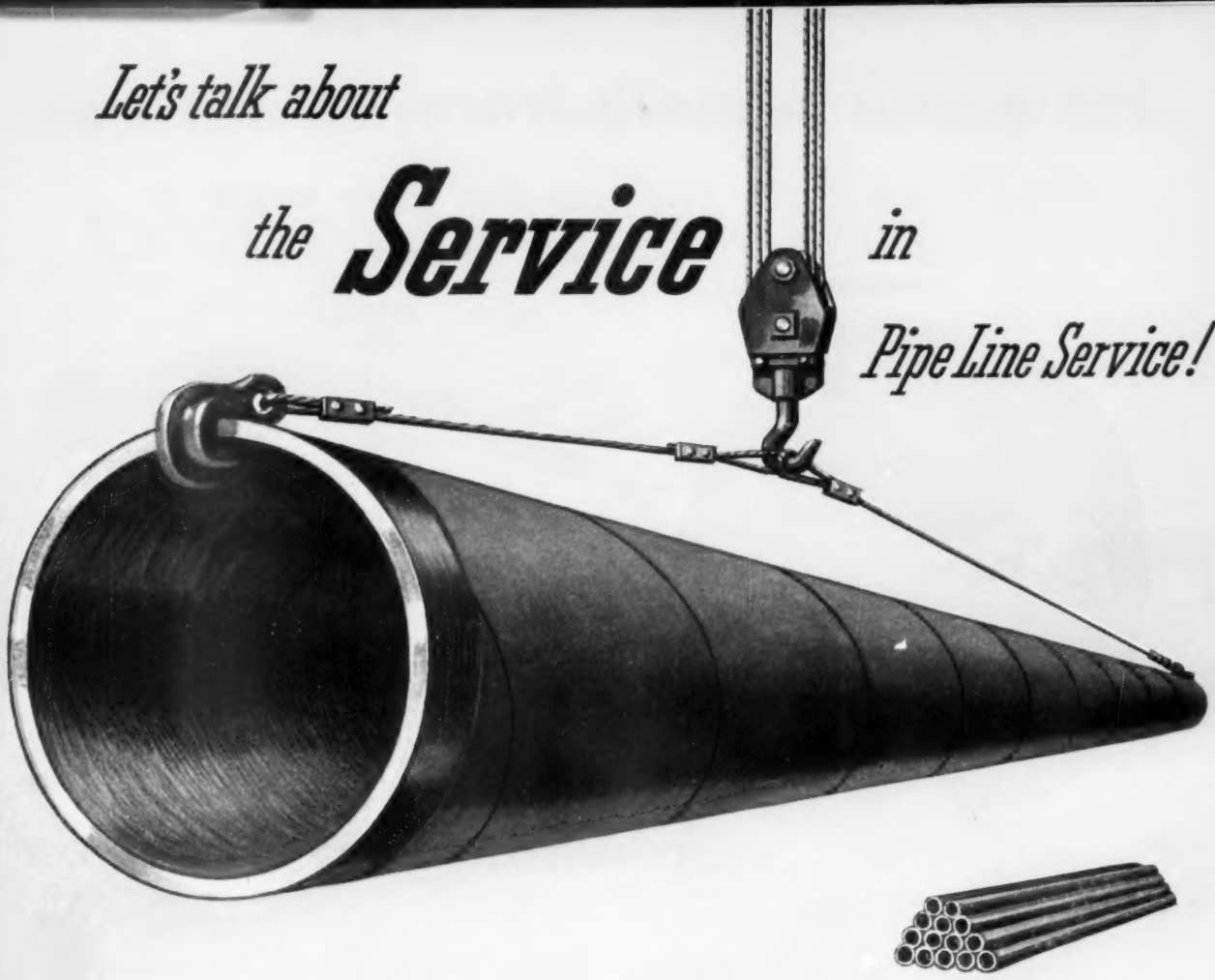
The development of the new pool, which has an estimated maximum capacity of 14.8 billion cu ft, will provide an estimated peak day capacity of 110 MMcf.

Oklahoma construction okayed for Cities Service

Recently authorized is Cities Service Gas Co.'s $1.2 million project consisting of 60 miles of line in the Eureka area of Grant and Alfalfa counties, Okla. (Docket G-10934).

The FPC also okayed plans of nine independent producers to sell gas to Cities Service from the area.

Let's talk about the **Service** *in Pipe Line Service!*



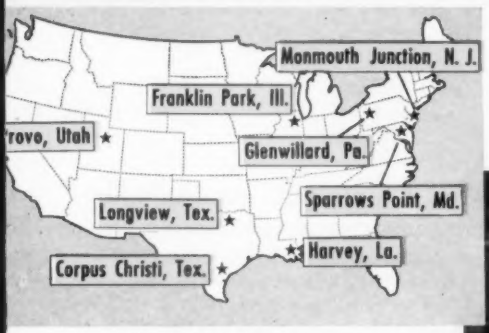
A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe *at no cost to you* . . . plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity. You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!



Also sales offices at

Atlanta, Georgia — Lincoln, Nebraska
Tulsa, Oklahoma — Houston, Texas

PIPE LINE SERVICE CORP. SERVICE EQUIPMENT MATERIALS FRANKLIN PARK, ILL.

Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

How you benefit from

New Fast Winding

ROCKWELL CHART DRIVES

SAVE TIME Whether you wind by key or crank, you will find that *new* fast winding Rockwell Chart Drives will reduce the time and effort required to service your recording instruments. Fewer turns, easier turns result from an entirely new gearing design.

REDUCE MAINTENANCE A stronger, double bushed winding pinion now minimizes one of the principal causes for chart drive failure. Powdered metal bushings throughout the new winding mechanism eliminate all need for lubrication.

FACTORY MODERNIZATION AND REBUILDING SERVICE All old model Rockwell Chart Drives returned to the factory will be modernized with the latest advancements including the new fast wind mechanism *at no additional cost* beyond the regular nominal service charge. Now is the time to upgrade your instrumentation. Ship us your old Rockwell Chart Drives for thorough rebuilding and modernization.

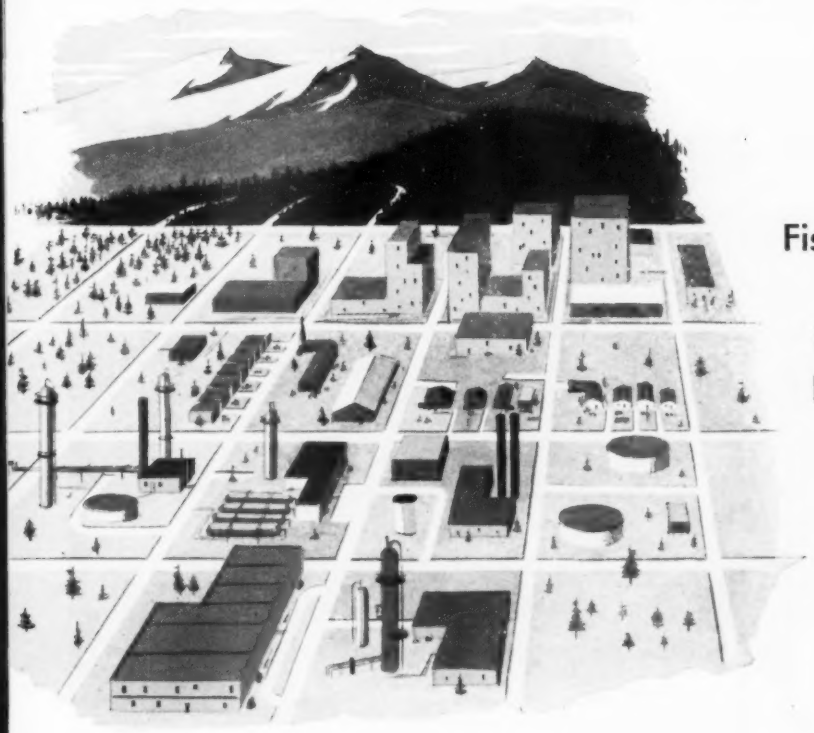
ROCKWELL MANUFACTURING COMPANY

INSTRUMENT DIVISION BOX 2396, TULSA, OKLA.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Texas New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Toronto, Ont.

how Fish Service Corporation helped bring a new age of energy to SPOKANE



From initial Survey to final completion Fish Service Corporation supervised all steps in converting Spokane Natural Gas Company from an obsolete Propane-air utility to a modern, efficient natural gas distributing system.

IN EARLY 1953 Spokane Gas and Fuel Company saw little hope for the future. Sales were declining, the system was obsolete, cash was low, and prospects were so dim new financing was hard to get.

Then, with the promise of Natural Gas via pipeline from the San Juan Basin, things began to look up. But the company had little experience in planning, financing and executing the modernization required to take advantage of the new supply.

The management then turned to experts. Fish Service Corporation was retained to take charge of all phases of the change.

First Fish made a survey. Then, based on that survey, new financing was obtained. On behalf of the company, Fish went before the state regulatory commission and the F.P.C. The system was modernized and enlarged with supervision and inspection by Fish. Rate structures were calculated by Fish, and the company organization was improved. Even the name was changed to the Spokane Natural Gas Company.

Results were gratifying. Demand went up immediately. By December 1957, demand is expected to reach a peak of 37 million cubic feet per day. A sick, declining company had been transformed to a vigorous, growing one.

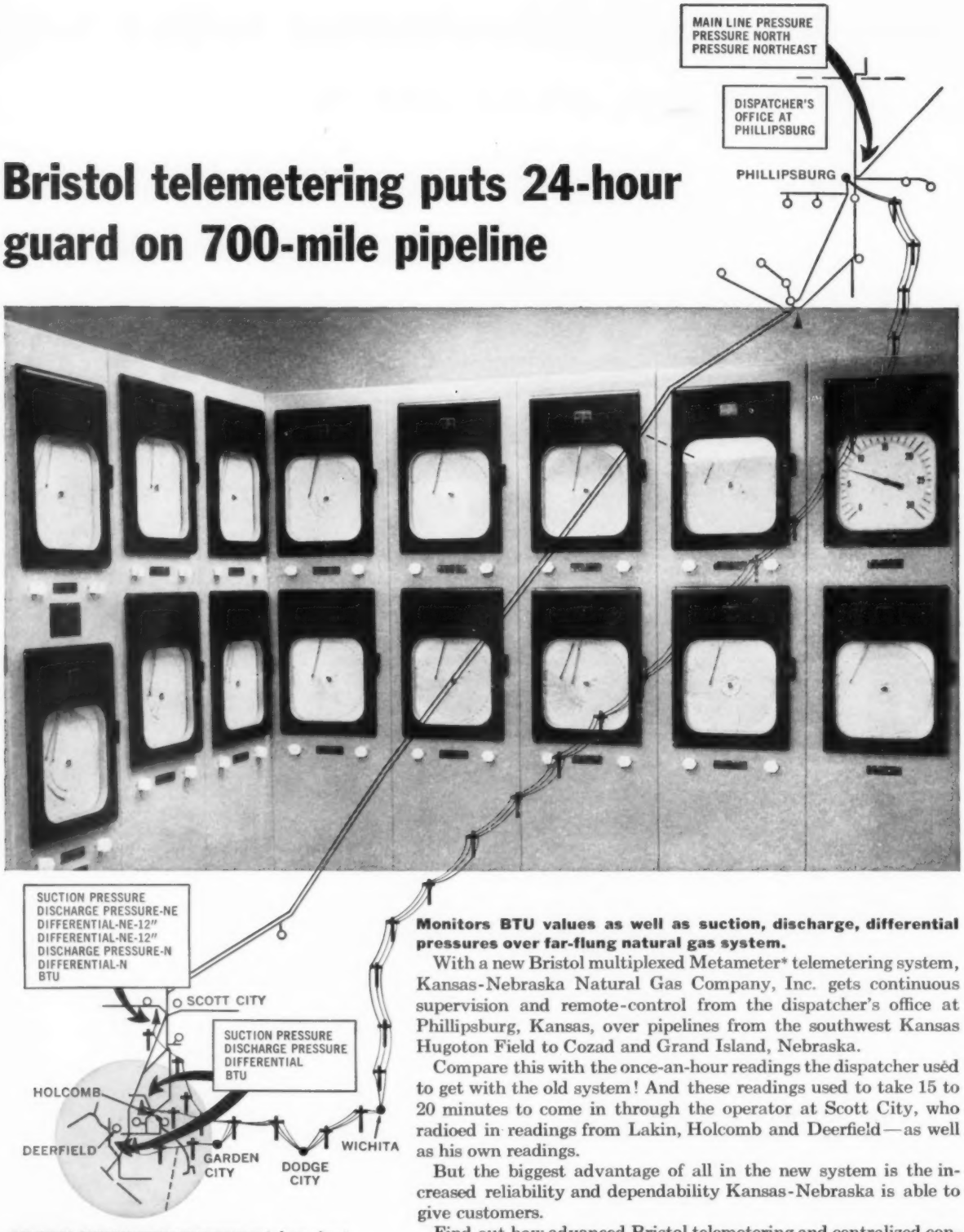
This may be an extreme example, but Fish Service Corporation may be able to help you, too. Why not call us and find out.

FISH SERVICE CORPORATION

HOUSTON, TEXAS

fish SERVICE CORPORATION

Bristol telemetering puts 24-hour guard on 700-mile pipeline



BRISTOL METAMETER* RECEIVERS (*photo, above*) at Kansas-Nebraska Natural Gas Company's Phillipsburg, Kansas, office give gas dispatcher complete data from field and compressor stations miles away—including suction, discharge, differential pressures and BTU values. Map shows telemetering system from southwest Kansas field to Phillipsburg. Pipelines serve Cozad and Grand Island, Nebraska (not shown).

Monitors BTU values as well as suction, discharge, differential pressures over far-flung natural gas system.

With a new Bristol multiplexed Metameter* telemetering system, Kansas-Nebraska Natural Gas Company, Inc. gets continuous supervision and remote-control from the dispatcher's office at Phillipsburg, Kansas, over pipelines from the southwest Kansas Hugoton Field to Cozad and Grand Island, Nebraska.

Compare this with the once-an-hour readings the dispatcher used to get with the old system! And these readings used to take 15 to 20 minutes to come in through the operator at Scott City, who radioed in readings from Lakin, Holcomb and Deerfield—as well as his own readings.

But the biggest advantage of all in the new system is the increased reliability and dependability Kansas-Nebraska is able to give customers.

Find out how advanced Bristol telemetering and centralized control systems can step up service and reduce costs on your pipeline. Write: The Bristol Company, 119 Bristol Rd., Waterbury 20, Conn.

*T. M. Reg U S. Pat. Off.

7.13

BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

pipeline news • *Cont'd.*

FPC accepts Mississippi construction filing

A $6.9 million plan has been presented to the FPC by Mississippi River Fuel Corp., St. Louis, which will increase the company's capacity by 10 MMcf/day. Mississippi wants to build 6400-hp additions at existing compressor stations and 54 miles of 26-in. line in Louisiana, Missouri, and Arkansas.

The company also proposes additional field facilities in Louisiana to deliver natural gas to Texas Gas Transmission Corp. for redelivery to Mississippi near Perryville, La.

According to the FPC filing, the proposed tariff changes would not result in any increase in charge to Panhandle and the other customers.

A separate research and development department is being organized by Tapecoat Co., Evanston, Ill. A. W. Bohne, Tapecoat's president, said initial emphasis will be on protective coatings for pipe, pipe joints, fittings, and couplings. Then the program will expand into the investigation of general protective coatings, paints, anticorrosion agents, new resins, and polymer formulations, as well as new and improved methods of evaluating the efficiency of the new products.

The Pittsburgh, Pa. district office of the Bristol Co. has moved into a new building at 2250 Noblestown Road. The new building houses the sales and services staff for Bristol's industrial instruments for recording, controlling, and telemetering. Bristol has also opened a new branch factory and repair laboratory in Houston.

GAS pipeline notes

Trunkline Gas Co., Houston, wants to change its gas tariff from a cost-of-service rate to a demand-commodity rate form for sales to its affiliate, Panhandle Eastern Pipe Line Co., and 18 other customers.

GAS pipeline people

W. M. Elmer
Texas Gas

F. K. Rader
Texas Gas

W. M. ELMER was elected president of Texas Gas Transmission Corp., Owensboro, succeeding the late W. T. Stevenson. Mr. Elmer has been executive or senior vice president and director of Texas Gas since 1955, a vice president since 1950, and has served as president and a director of Texas Gas Exploration Corp. since 1953. The company has also elected F. K. RADER vice president and H. L. STOWERS vice president and chief engineer. Mr. Rader was assistant to the executive vice president. Mr. Stowers has been chief engineer of Texas Gas and a predecessor company for the past 14 years. Other appointments include T. L. MCWILLIAMS to assistant superintendent of the compressor station department, succeeding J. B. EATON JR., who is now superintendent of the department; and HOOVER L. GIBSON, formerly Division III superintendent in the compressor station department, to superintendent of compressor engineering.

MELVIN A. FINUF, assistant general manager of sales since 1946, has been promoted to general manager of sales at the J. B. Beaird Co. Inc., Shreveport. Succeeding him as assistant manager is GERALD POPE. Mr. Pope's successor as as district sales manager in Houston is J. R. SIMS. He was formerly compressor division sales engineer in Midland, Texas.

E. D. KLINGER has retired as chief geologist for the Lion Oil division of Monsanto Chemical Co.

H. L. Stowers
Texas Gas

T. L. McWilliams
Texas Gas

When converting to Natural Gas... Don't overlook the Importance of **PEAK SHAVING** *and* **STANDBY EQUIPMENT!**

Investigate

SEMET SOLVAY'S

EXCLUSIVE OIL GAS-MAKING PROCESSES FOR EFFICIENT, LOW COST PROTECTION!

SEMET-SOLVAY POUGHKEEPSIE PROCESS*—a non-regenerative type of machine especially suited for use with light oil. A simple and inexpensive conversion.

SEMET-SOLVAY POUGHKEEPSIE PROCESS WITH BACK BLAST*—designed and developed by Semet-Solvay, this machine insures satisfactory gas production on a continuous 24 hour basis. Because you get positive carbon removal during the regular cycle, you need no stand-by time for scurfing—even with oil as heavy as Bunker "C". High thermal production capacity. Most efficient of the low cost conversions.

SEMET-SOLVAY REGENERATIVE REVERSE FLOW PROCESS*—outstanding features are its high capacity with both low carbon and high carbon oils. Requires minimum man power, has fast start-up and ease of control.

ENGINEERING SERVICE—complete service including all technical phases from project survey and design to purchasing, fabrication, and construction.

*Processes covered by foreign and domestic patents numbers.

(1) U.S. 2,700,601
(2) U.S. 2,700,602
(3) U.S. 2 605,176
(4) U.S. 2,605,177

SEMET-SOLVAY
ENGINEERING DIVISION

Allied Chemical & Dye Corporation
40 Rector Street
New York 6, N. Y.

pipeline people • *Cont'd.*

He plans to serve as a consultant to the oil and gas industries from offices in Shreveport.

ROBERT O. PARKER, supervisor of accounting at Trunkline Gas Co., Houston, since 1954, has been named assistant controller.

J. M. CLARK has resigned as vice president for production of Pacific Northwest Pipeline Corp., Salt Lake City. Mr. Clark will devote his full attention to the production activities of Northwest Production Corp., a PNW subsidiary in which he is also a vice president. LESTER G. TRUBY JR., Pacific's manager of production operations, has been promoted to new responsibilities as manager of production. He will have charge of all phases of Pacific's production department, including geology, leasing, and drilling.

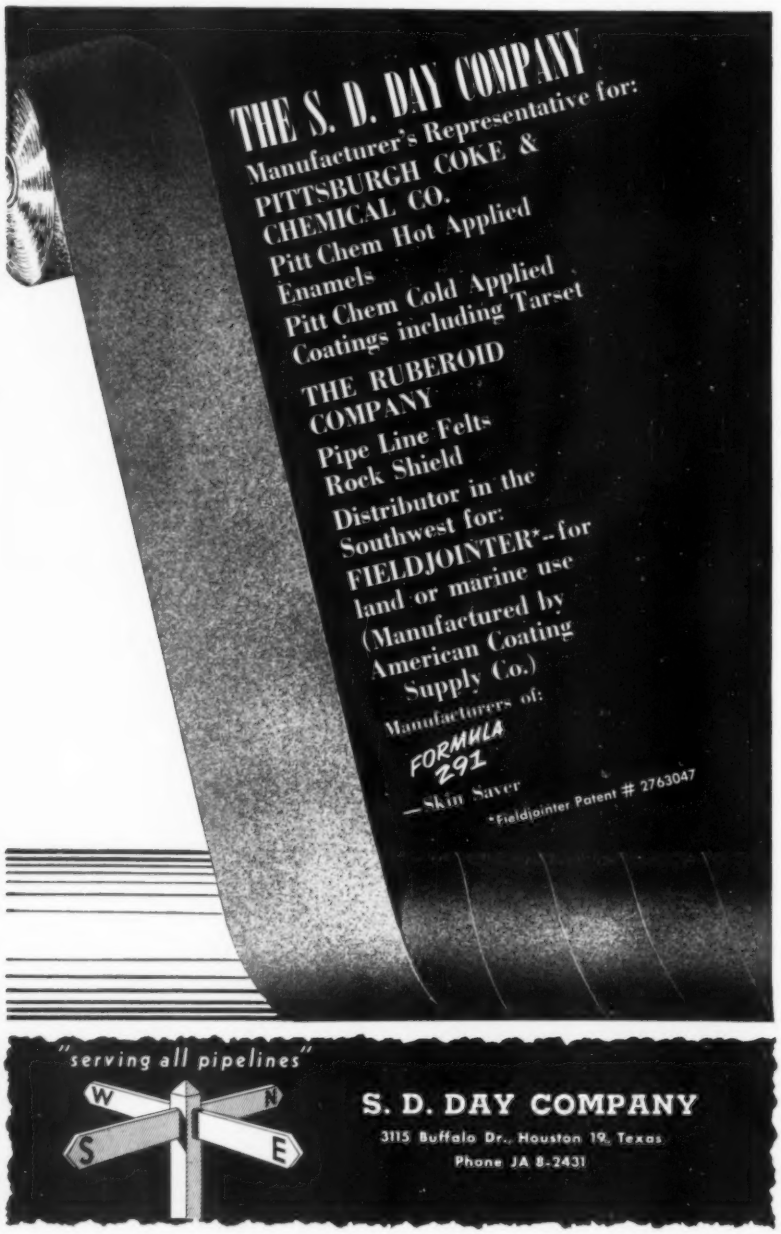
Several appointments have been made by Natural Gas Pipeline Co. of America, Chicago. D. A. HARDESTY, assistant vice president in charge of employee and public relations of NGPL and its affiliates, was named vice president in charge of the same area. C. E. HOLMES, vice president in charge of sales, and REMICK MCDOWELL, executive vice president of the parent company, Peoples Gas Light & Coke Co., were named to the board of Texas Illinois Natural Gas Pipeline Co. and NGPL. New president of the affiliated Peoples Production Co. is MARK V. BURLINGAME, executive vice president of NGPL and Texas Illinois. J. G. DICKINSON, vice president in charge of NGPL's production, was named to the board of Peoples Production; and F. P. BURNS, assistant vice president in charge of production, was elected vice president of Peoples Production and Texoma Production Co.

D. A. Hardesty
NGPL

C. E. Holmes
NGPL

N. E. TANNER, formerly president, is now chairman of the board of Trans-Canada Pipe Lines Ltd. CHARLES S. COATES, formerly executive vice president and general manager of the company, was elected president. Mr. Tanner, president of the company since 1954, headquarters at Calgary, Alta.; Mr. Coates maintains offices in Toronto. Mr. Coates left Tennessee Gas Transmission Co. in 1954 to join Trans-Canada.

A number of personnel changes have been announced by Cooper-Bessemer Corp., Mt. Vernon, Ohio. ROBERT F. LAY is now vice president and assistant general manager. He is succeeded as general sales manager by GRANT C. WOODARD, who has been the assistant manager of sales. R. F. KYMER has been promoted to assistant chief engineer of the products division and M. J. HELMICH to assistant chief engineer of the development division. RALPH L. BOYER has been elected to vice president and director of engineering. He fills the position vacated by HEWITT A. GEHRES, who is retiring. Also retiring is BRUNO THIEL, who is succeeded as supervisor of compres-



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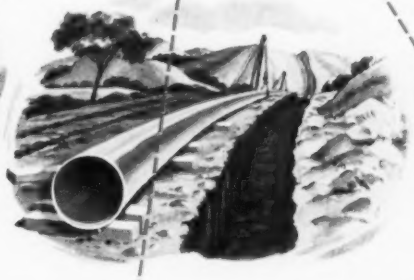

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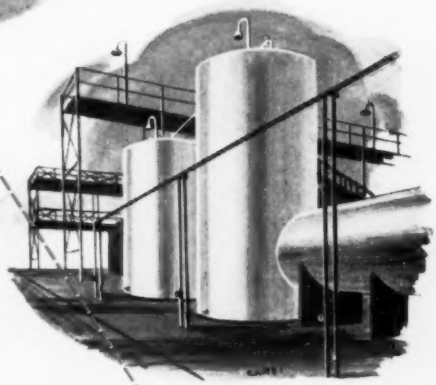

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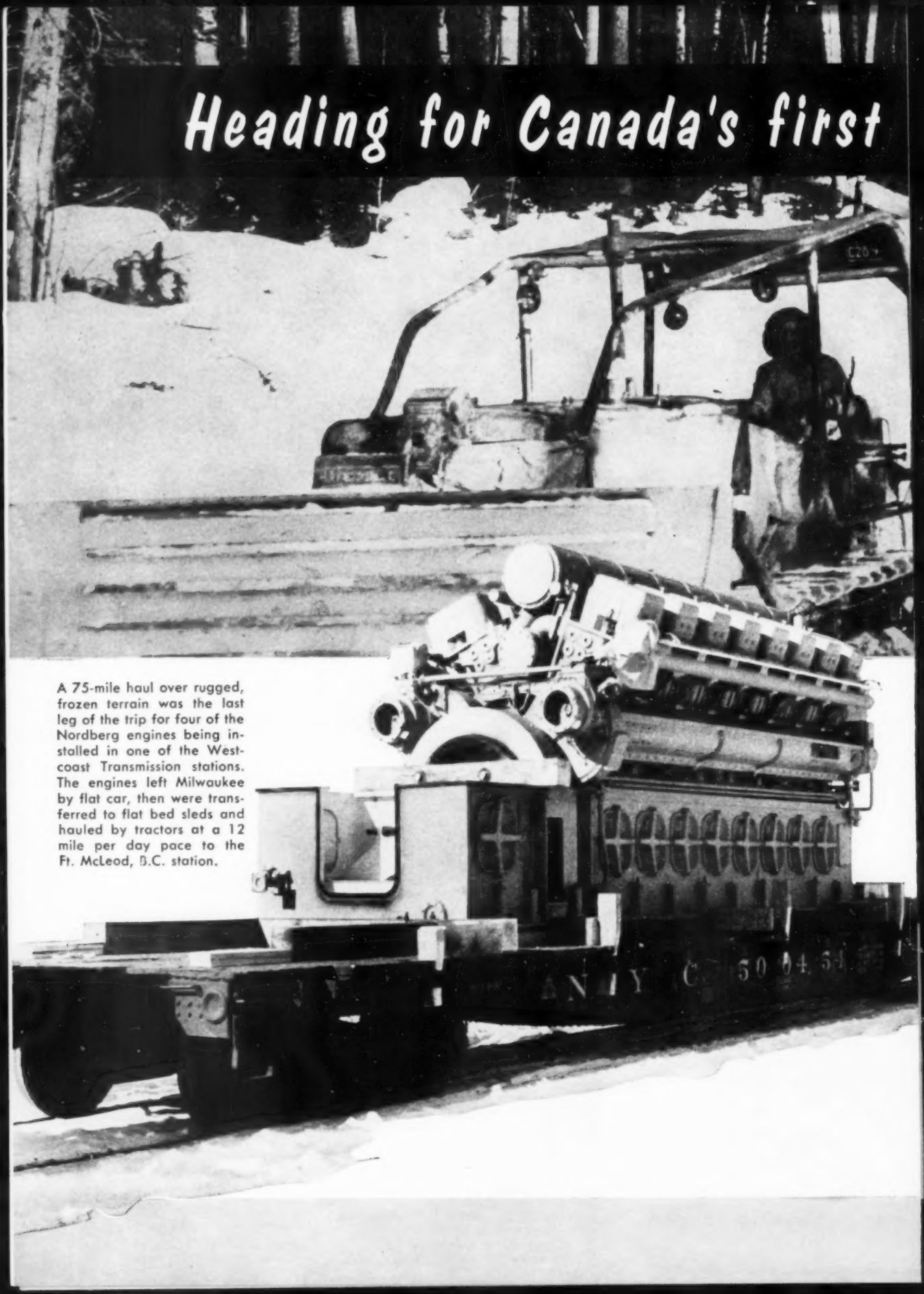

A 75-mile haul over rugged, frozen terrain was the last leg of the trip for four of the Nordberg engines being installed in one of the Westcoast Transmission stations. The engines left Milwaukee by flat car, then were transferred to flat bed sleds and hauled by tractors at a 12 mile per day pace to the Ft. McLeod, B.C. station.

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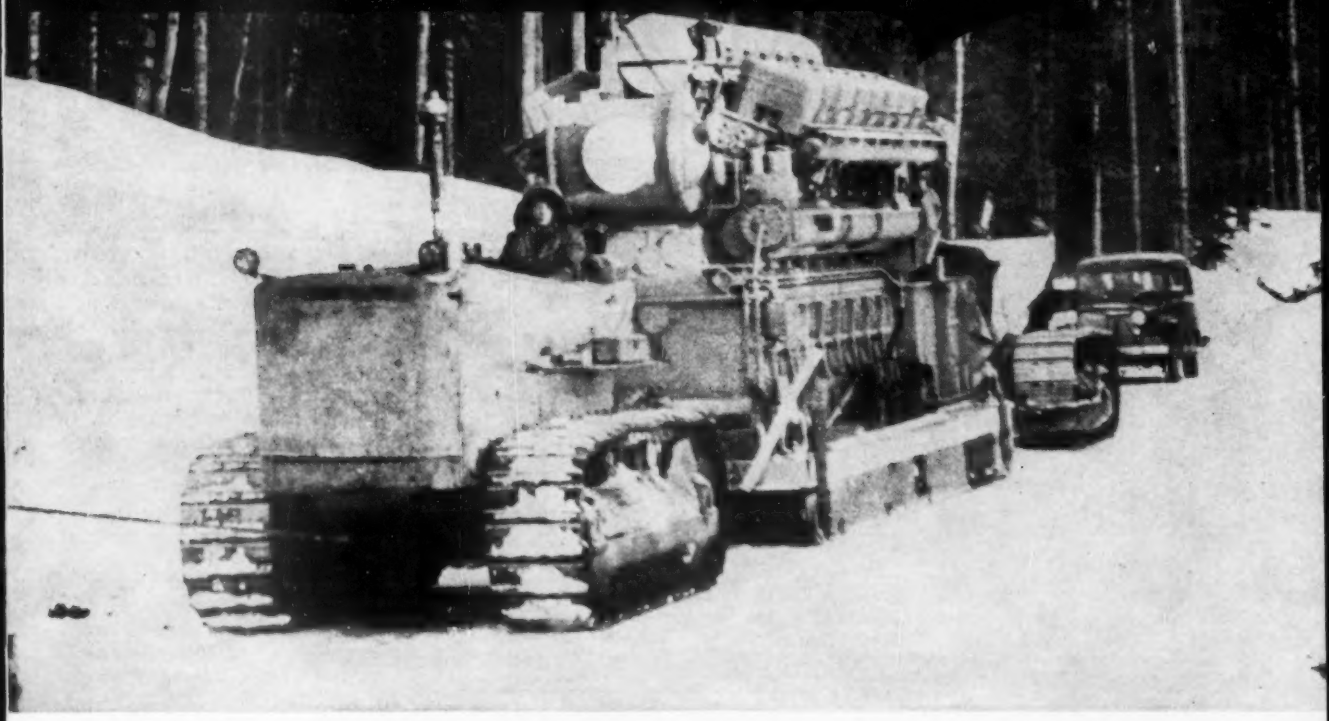

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sion engineering by WILLIAM F. HARTWICK. RICHARD J. WHEELOCK has been named district manager of Cooper-Bessemer's Chicago field office and DONALD R. BOHANNAN has been appointed branch manager. Other new branch managers are FRANK J. HUNTER, in St. Louis and Kansas City area; and C. L. MCDOUGALL, in Odessa, Texas. Mr. Hunter succeeds W. S. ARTHUR, who is retiring. CHARLES L. WHITE, district manager of the North Central states area, has also retired after 28 years with the company. C. G. COOPER has been elected president of Cooper-Bessemer International. In addition, he is president of Cooper-Bessemer Overseas Corp. and Cooper-Bessemer of Canada Ltd. He succeeds MICHAEL G. POLLOCK, who is retiring from active service.

EDMOND M. FOO, former project engineer with the Alberta Petroleum and Natural Gas Conservation Board, has joined TransCanada Pipe Lines Ltd. as gas engineer in the gas supply department.

ARTHUR R. ERICKSON has been named exploration manager for Northern Natural Gas Producing Co., a wholly owned subsidiary of Northern Natural Gas Co., Omaha. He was formerly chief geologist.

Texas Gas Transmission Co., Owensboro, Ky., has appointed C. E. COFFEY superintendent of the compressor department's Kentucky and Indiana division. The 23-year compressor veteran has been manager of the Jeffersontown compressor station since 1949.

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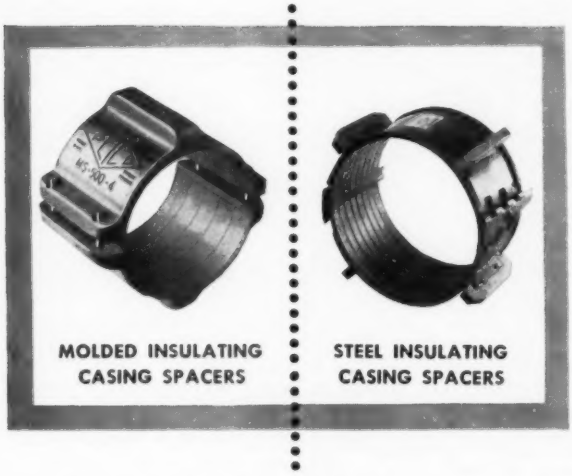

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